Scientific Excellence • Resource Protection & Conservation • Benefits for Canadians
Excellence scientifique • Protection et conservation des ressources • Bénéfices aux Canadiens

An Assessment of Five Upper Fraser River Chinook Salmon Sport Fisheries, 1988

N.D. Schubert

Department of Fisheries and Oceans
Fisheries Branch
80 - 6th Street
New Westminster, British Columbia V3L 5B3

March 1990

Canadian Manuscript Report of
Fisheries and Aquatic Sciences
No. 2051

Fisheries and Oceans Pêches et Océans

Canada

Canadian Manuscript Report of Fisheries and Aquatic Sciences

Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional problems. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Manuscript reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1–900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 901–1425 were issued as Manuscript Reports of the Fisheries Research Board of Canada. Numbers 1426–1550 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Manuscript reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Les rapports manuscrits contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui traitent de problèmes nationaux ou régionaux. La distribution en est limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports manuscrits peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports manuscrits sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1 à 900 de cette série ont été publiés à titre de manuscrits (série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés comme manuscrits (série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros 901 à 1425 ont été publiés à titre de rapports manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 sont parus à titre de rapports manuscrits du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 1551.

Les rapports manuscrits sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Manuscript Report of
Fisheries and Aquatic Sciences 2051

March 1990

AN ASSESSMENT OF FIVE UPPER FRASER RIVER CHINOOK SALMON SPORT FISHERIES, 1988

by

N.D. Schubert

Department of Fisheries and Oceans
Fisheries Branch
330 - 80 Sixth Street
New Westminster, B.C.
V3L 5B3

90-04975/

© Minister of Supply and Services Canada 1990

Cat. No. Fs 97-4/2051E ISSN 0706-6473

Correct citation for this publication:

Schubert, N.D. 1990. An assessment of five upper Fraser River chinook salmon sport fisheries, 1988. Can. MS Rep. Fish. Aquat. Sci. 2051: 58 p.

CONTENTS

Page

LIST OF FIGURES vi

LIST OF TABLES vii

LIST OF APPENDICES viii

ABSTRACT/RÉSUMÉ xi

INTRODUCTION 1

STUDY AREA DESCRIPTION 1
BOWRON RIVER 1
BRIDGE RIVER 1
QUESNEL RIVER 1
SHUSWAP RIVER 1
THOMPSON RIVER 5

FISHERY REGULATIONS 5

METHODS 5
STUDY DESIGN 5
Bowron River 5
Bridge River 7
Quesnel River 7
Shuswap River 7
Thompson River 8
DATA MANAGEMENT 8
DATA ANALYSES 8
Bowron River 8
Angler Effort 8
Catch per Unit Effort 9
Harvest and Release 11
Harvest Rate 11
Angler Characteristics 11
Bridge River 11
Quesnel River 11
Angler Effort 11
Catch per Unit Effort 12
Harvest and Release 12
Shuswap River 13
Thompson River 13

RESULTS 13
BOWRON RIVER 13
Effort Distribution 13
Angler Effort 13
Daily Profile 13
Total Angler Effort 13

Page

Catch Per Unit Effort 13
Harvest 13
Release 16
Harvest 16
Release 16
Angler Characteristics 16
Angler Day Length 16
Target Species 16
Gear Type 16
Previous Trip 16
BRIDGE RIVER 16
Effort 16
Catch Per Unit Effort 16
Harvest 16
Release 16
Angler Characteristics 16
QUESNEL RIVER 16
Effort Distribution 16
Angler Effort 17
Daily Profile 17
Total Angler Effort 17
Catch per Unit Effort 17
Harvest 17
Release 17
Harvest 17
Release 17
Angler Characteristics 17
Angler Day Length 17
Target Species 17
Gear Type 17
Previous Trip 17
SHUSWAP RIVER 17
Effort Distribution 17
Angler Effort 18
Daily Profile 18
Total Angler Effort 18
Catch Per Unit Effort 18
Harvest 18
Release 18
Harvest 18
Harvest sampling 18
Release 18
Angler Characteristics 18
Angler Day Length 18
Target Species 18
Gear Type 18
Previous Trip 18
THOMPSON RIVER 18
Effort Distribution 18
Angler Effort 18
Daily Profile 18

Page

Total Angler Effort 18
Catch per Unit Effort 19
Harvest 19
Release 19
Harvest 19
Harvest Sampling 19
Release 19
Angler Characteristics 19
Angler Day Length 19
Target Species 19
Gear Type 19
Previous Trip 19

DISCUSSION 19
GENERAL 19
Bowron River 19
Bridge River 19
Quesnel River 20
Shuswap River 20
Thompson River 21
INCOMPLETE TRIP INTERVIEW BIAS 21
ESTIMATION OF ANGLER DAY LENGTH 22

RECOMMENDATIONS 24

SUMMARY 24

ACKNOWLEDGEMENTS 25

LITERATURE CITED 26

LIST OF FIGURES

Figure		Page
1.	Study area location map	2
2.	Bowron River sport fishery location map	3
3.	Quesnel River sport fishery location map	4
4.	Shuswap River sport fishery study area location map	6
5.	Hourly angler effort profiles in the upper Fraser River sport fisheries, 1988	15
6.	Harvest per unit effort of chinook adults by angler trip duration, in four 1988 upper Fraser River sport fisheries	23

LIST OF TABLES

Table		Page
1.	Summary of 1988 sport fishery regulations in the five upper Fraser River study areas	5
2.	Summary of harvest and angler effort in the 1988 upper Fraser River sport fisheries	14
3.	Summary of angler characteristics in the 1988 upper Fraser River sport fisheries	14
4.	Summary of harvest rate, catchability and harvest per unit effort (HPUE) in the 1988 upper Fraser River sport fisheries	20
5.	Estimated chinook adult harvest per unit effort (HPUE), by interview type, in the 1988 upper Fraser River sport fisheries	22

LIST OF APPENDICES

Appendix		Page
1a.	Summary of interview responses by day at Beaver Road Bridge in the 1988 Bowron River sport fishery	28
1b.	Summary of interview responses by day at Km 80 in the 1988 Bowron River sport fishery	29
1c.	Summary of interview responses by day at Haggen Creek in the 1988 Bowron River sport fishery	30
1d.	Summary of interview responses by day from the roving survey of the 1987 Bowron River sport fishery	31
2.	Daily angler counts by region in the 1988 Bowron River sport fishery	32
3.	Daily angler effort profiles in the 1988 Bowron, Bridge, Quesnel, Shuswap and Thompson River sport fisheries	33
4.	Daily catch per angler hour (harvest and release) in the 1988 Bowron River sport fishery	34
5.	Summary of interview responses by day in the 1988 Bridge River sport fishery	35
6.	Mean nose-fork length and weight, by age, sex and date, of chinook salmon harvested in the 1988 Bridge River sport fishing	36
7.	Summary of interview responses by day from the roving survey of the 1988 upper Quesnel River sport fishery	37
8.	Daily angler counts in the 1988 upper Quesnel River sport fishery	38
9.	Daily catch per angler hour (harvest and release) in the 1988 upper Quesnel River sport fishery	39
10a.	Summary of interview responses by day at Chuck's Pool in the 1988 lower Shuswap River sport fishery	40
10b.	Summary of interview responses by day at Log Dump Pool in the 1988 lower Shuswap River sport fishery	41
10c.	Summary of interview responses by day from the roving survey of the 1988 lower Shuswap River sport fishery	42

Appendix **Page**

11a. Daily angler counts by subarea in the 1988 lower Shuswap River sport fishery, Mara Lake to Ashton Creek Bridge 43

11b. Daily angler counts by subarea in the 1988 lower Shuswap River sport fishery, Ashton Creek Bridge to Mabel Lake 43

12. Daily catch per angler hour (harvest and release) in the 1988 lower Shuswap River sport fishery 44

13. Mean nose-fork length and weight, by flesh color, age and sex, of chinook salmon harvested in the 1988 lower Shuswap River sport fisnery 45

14a. Summary of interview responses by day on the east bank in the 1988 Thompson River sport fishery 46

14b. Summary of interview responses by day on the west bank in the 1988 Thompson River sport fishery 47

15. Daily catch per angler hour (harvest and release) in the 1988 Thompson River (Spences Bridge) sport fishery 48

16a. Mean nose-fork length and weight, by flesh color, age, and sex, of chinook salmon harvested on the east side in the 1988 Thompson River sport fishery 49

16b. Mean nose-fork length and weight, by flesh color, age, and sex, of chinook salmon harvested on the west side in the 1988 Thompson River sport fishery 51

17. Summary of angler estimates of chinook adult harvest and hours fished in the most recent fishing trip, by area and trip frequency 52

18a. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Bowron River sport fishery 53

18b. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 upper Quesnel River sport fishery 53

18c. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 lower Shuswap River sport fishery 54

18d. Number of anglers interviewed, total angler efort, chinook adult harvest and HPUE by trip duration in the 1988 Thompson River sport fishery 54

Appendix **Page**

18c. Number of anglers interviewed, total angler effort chinook adult harvest and HPUE by trip duration in the 1988 Quesnel River sport fishery, estimated from complete trip interviews 54

18d. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 upper Quesnel River sport fishery, estimated from all interviews 54

18e. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Shuswap River sport fishery, estimated from complete trip interviews 55

18f. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Shuswap River sport fishery, estimated from all interviews 55

18g. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Thompson River (Spences Bridge) sport fishery, estimated from complete trip interviews 56

19. Variance estimation procedure for access point surveys 57

ABSTRACT

Schubert, N.D. 1990. An assessment of five upper Fraser River chinook salmon sport fisheries, 1988. Can. MS Rep. Fish. Aquat. Sci. 2051: 58 p.

The retention of chinook salmon (**Oncorhynchus tshawytscha**) adults in Fraser River system sport fisheries was eliminated in 1980 in response to escapement declines. By 1986, improved escapements permitted the reopening of sport fisheries for chinook adults in four upper Fraser River tributaries, with six chinook fisheries opened in 1987. In 1988, chinook fisheries were opened in the Bowron, Bridge, Clearwater, Quesnel, Shuswap, South Thompson and Thompson Rivers. The fisheries were regulated through harvest ceilings, time and area restrictions and daily and annual angler harvest limits. With the exceptions of the Clearwater and South Thompson Rivers, each fishery was evaluated using either a roving or a hybrid on-site survey.

A total of 1,585 anglers were interviewed in five study areas. An estimated 22,692 angler hours were expended to harvest an estimated 413 chinook adults, 48 chinook jacks, 156 rainbow trout, 24 Dolly Varden char, 24 whitefish and 30 squawfish. Estimated releases totaled 65 chinook adults, 25 chinook jacks, 395 rainbow trout, 2 steelhead trout, 33 Dolly Varden char, 32 whitefish, 57 squawfish and 4 suckers. Thirty-six of the chinook adults and 1 chinook jack were marked with adipose fin clips.

The study identified and discussed general biases associated with creel surveys.

Key words: upper Fraser River, sport fisheries, chinook salmon, angler effort, harvest, release, bias.

RÉSUMÉ

Schubert, N.D. 1990. An assessment of five upper Fraser River chinook salmon sport fisheries, 1988. Can. MS Rep. Fish. Aquat. Sci. 2051: 58 p.

En 1980, on a interdit aux pêcheurs sportifs de garder les saumons quinnats adultes (**Oncorhynchus tshawytscha**) capturés dans le réseau du Fraser à cause de la chute des échappées. Le volume des échappées s'étant amélioré en 1986, la pêche sportive de quinnats adultes a été réinstituée dans quatre affluents de la partie supérieure du Fraser. En 1987, elle était pratiquée dans six pêcheries. En 1988, la pêche au quinnat a été permise dans les rivières Bowron, Bridge, Clearwater, Quesnel, Shuswap, South Thompson et Thompson. Elle était réglementée par l'adoption de limites par secteur, de restrictions concernant la période et la zone de pêche, et de limites quotidiennes et annuelles pour les pêcheurs sportifs. Toutes les pêcheries, à l'exception de celles des rivières Clearwater et South Thompson, ont été évaluées au cours d'enquêtes sur place de type itinérant ou semi-stationnaire.

Au total, 1 585 pêcheurs sportifs ont été interrogés dans cinq zones d'étude. Selon les estimations, la pêche sportive de 413 quinnats adultes, 48 jeunes quinnats mâles, 156 truites arc-en-ciel, 24 Dolly Varden, 24 poisson blanc et 30 sauvagesses du nord a exigé 22 692 heures de pêche. Par ailleurs, il est estimé que 65 quinnats adultes, 25 jeunes quinnats mâles, 395 truites arc-en-ciel, 2 truite stealhead, 33 Dolly Varden, 32 poissons blancs, 57 sauvagesses du nord, et 4 meuniers ont été remis à l'eau. Trente-six des quinnats adultes et 1 jeune quinnat mâle capturés avait la nageoire adipeuse rognée.

Les auteurs de l'etude ont cerné et examiné les distorsions générales inhérentes à de telles enquêtes fondées sur l'interrogation de pêcheurs.

Mots-clés: partie supérieure du Fraser, pêches sportives, saumon quinnat, effort de pêche sportive, remise à l'eau, distorsion.

INTRODUCTION

The escapement of chinook salmon (**Oncorhynchus tshawytscha**) to the Fraser River system has improved since the early 1980's to an extent which permitted the reopening of sport fisheries in selected terminal areas. In 1986, sport fisheries for chinook salmon adults were permitted in four upper Fraser River tributaries where escapements were increasing at a rate faster than expected and where harvest could be restricted to single stocks (Schubert 1988). In 1987, sport fisheries for chinook adults were permitted in six upper Fraser River tributaries, including one mixed stock area where harvest rates were constrained to a level which minimized the impact on even the slowest rebuilding stock (Schubert 1989). Each fishery was managed to a harvest ceiling through regulation of fishing time and area and of daily and annual angler harvest.

In 1988, sport fisheries were opened in the Bowron, Bridge, Clearwater, Quesnel, Shuswap and South Thompson rivers, with fishing time expanded over 1987 in the Shuswap and South Thompson rivers. An additional fishery was opened in the Thompson River at the Nicola River outlet (Fig. 1). In most areas, structured assessment studies monitored fishery performance, evaluated stock impacts and provided data upon which future management decisions could be made.

This report describes the study design and field procedures and documents the results of the 1988 sport fishery assessment studies in the Bowron, Bridge, upper Quesnel, lower Shuswap and Thompson rivers. The report presents estimates of angler effort, harvest and release by species, and angler attributes in each fishery, and concludes with a discussion of results and recommendations for the management and assessment of future fisheries.

STUDY AREA DESCRIPTION

BOWRON RIVER

The Bowron River arises in the Cariboo Mountains of central British Columbia and flows in a northwesterly direction for approximately 230 km, entering the Fraser River 50 km east of Prince George (Fig. 2). Chinook sport fishing was permitted between the Bowron Forest Road and Haggen Creek bridges (115 km). The open area was accessible from several forest roads and by boat.

BRIDGE RIVER

The Bridge River originates in the Coast Mountains of southwestern British Columbia and flows in an easterly direction for approximately 140 km, entering the Fraser River approximately 6 km north of Lillooet (Fig. 1). Chinook sport fishing was permitted in a 200 m section of the Bridge River immediately above the confluence with the Fraser River. The open area was accessible from a road by traversing land owned by the Bridge River Indian Band. Chinook adults from most upper Fraser River stocks were available to the sport fishery before migrating past the Bridge River Rapids, immediately upstream on the Fraser River.

QUESNEL RIVER

The Quesnel River originates in the Cariboo Mountains and flows in a northwesterly direction, entering the Fraser River at Quesnel (Fig. 3). Chinook sport fishing was permitted in a section of the river between the mouth and Beaver Creek (57 km) and between Morehead Creek and the outlet of Quesnel Lake (25 km). Only the latter area was assessed in 1988.

SHUSWAP RIVER

The Shuswap River originates in the Monashee Mountains of south-cen-

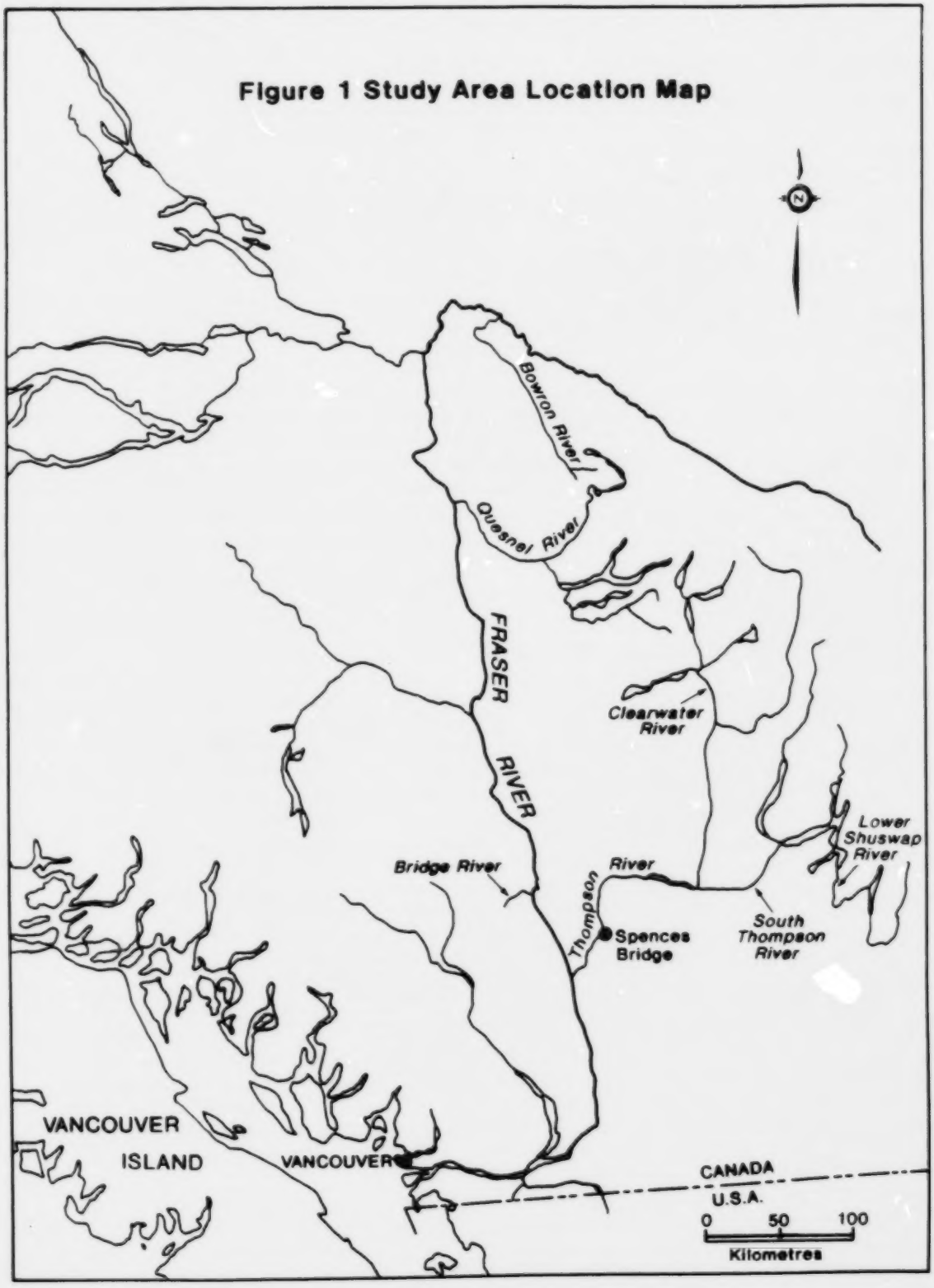
Figure 1 Study Area Location Map
N
Bowron River
Quesnel River
FRASER RIVER
Clearwater River
Lower Shuswap River
Bridge River
Thompson River
Spences Bridge
South Thompson River
VANCOUVER ISLAND
VANCOUVER
CANADA
U.S.A.
0 50 100
Kilometres

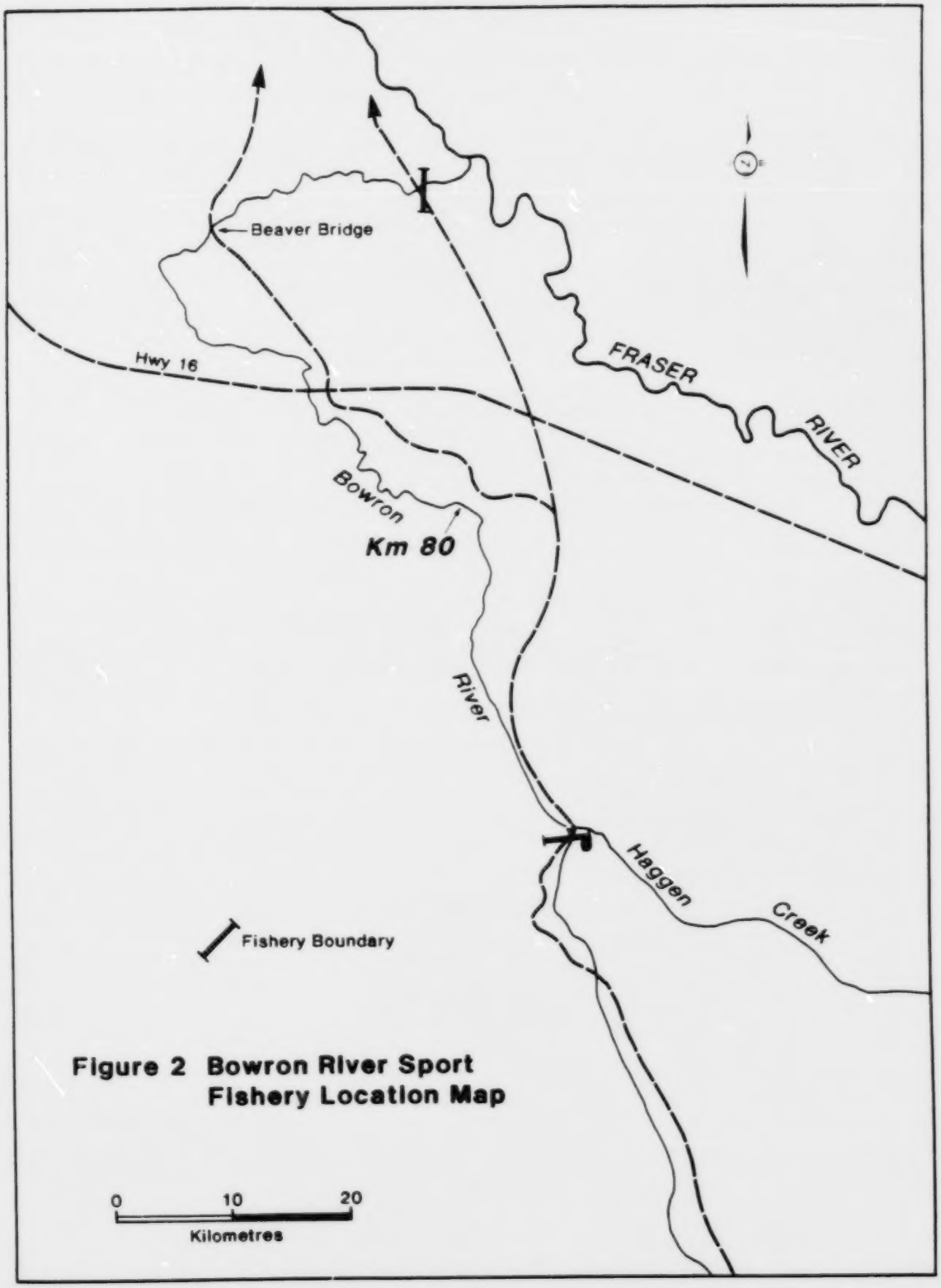

Figure 2 Bowron River Sport Fishery Location Map

Figure 3 Quesnel River Sport Fishery Location Map

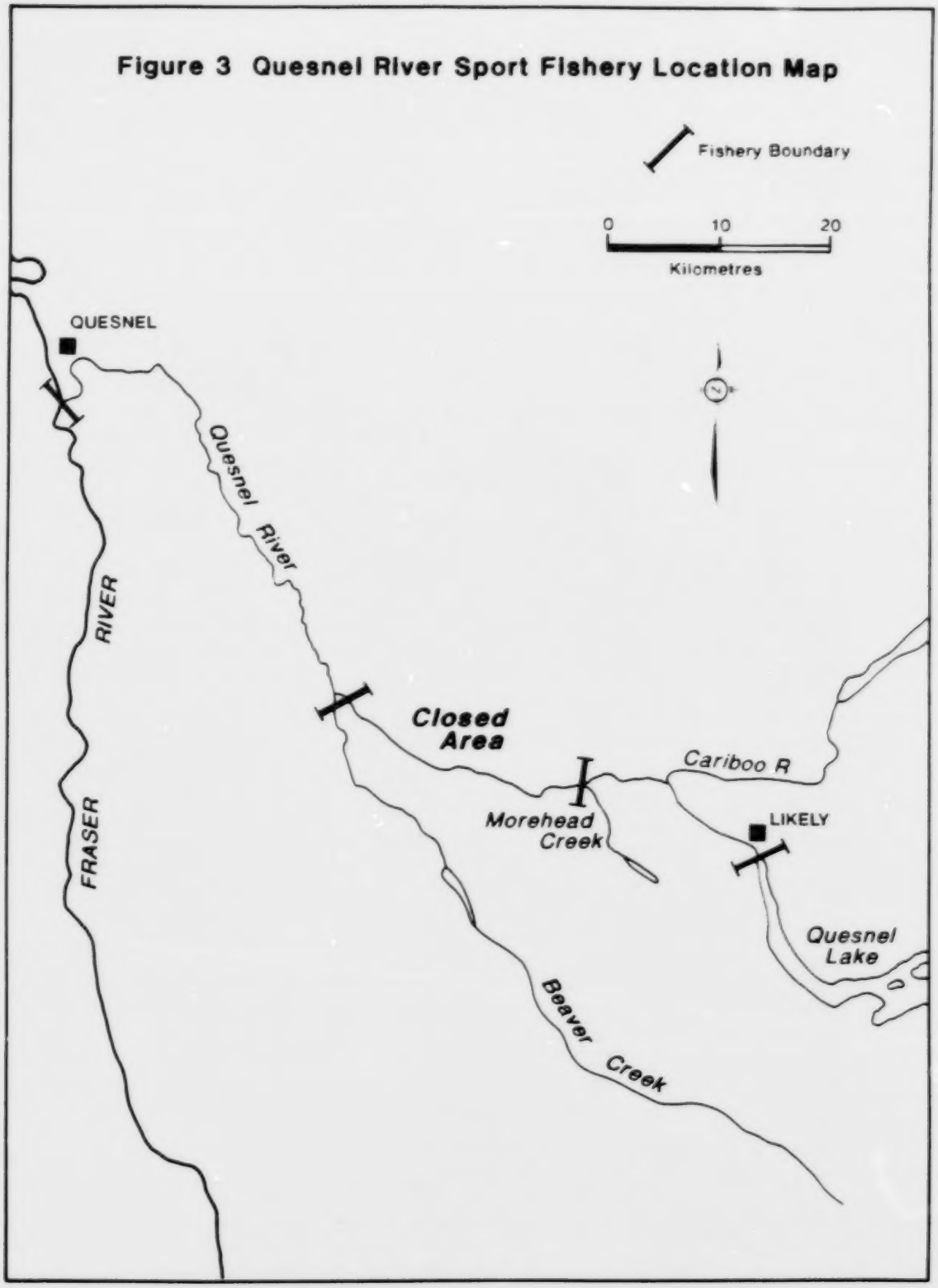

Table 1. Summary of 1988 sport fishery regulations in the five upper Fraser River study areas.

Location	Open period	Angler catch limits		Days open per week	Total days open	Harvest ceiling
		Daily	Annual			
Bowron River	Jul 23 to Aug 7	2	10	7	16	300
Bridge River [a]	May 24 to Jul 26	1	10	1 [b]	10	300
Quesnel River	Aug 6 to Sep 10	2	10	2	11	200
Shuswap River	Aug 24 to Sep 7	2	10	7	15	500
Thompson River	Jul 22 to Aug 26	1	10	1 [b]	6	150

[a] Fishery cancelled effective May 25.
[b] Open between 8:00 AM and 8:00 PM only.

tral British Columbia and flows in a northwesterly direction, entering Mara Lake east of Salmon Arm. Chinook sport fishing was permitted in the lower Shuswap River between Mara and Mabel lakes (Fig. 4). The open area was accessible from several roads and by boat. Because sport fishing was permitted only in September, lower Shuswap River chinook salmon were the only stock available to the fishery.

THOMPSON RIVER

The Thompson River arises at Kamloops Lake and flows in a southwesterly direction for 109 km, entering the Fraser River at Lytton (Fig. 1). Chinook sport fishing was permitted in an approximately 1 km section between the Highway 8 bridge at Spences Bridge and the upstream bank of the Nicola River. The open area was accessible by road on both sides of the river.

FISHERY REGULATIONS

In general, the 1988 sport fisheries were managed as in 1987, with restrictions in fishing time, daily and annual angler harvest limits and fishery-specific harvest ceilings. The main change from 1987 was an increase in the individual daily harvest limit from one to two chinook adults and an increase in fishing time in the Shuswap River fishery. Regulations are summarized by fishery in Table 1.

METHODS

STUDY DESIGN

Bowron River

The Bowron River sport fishery was assessed, using a hybrid design (Schubert 1988), between July 23 and August 7, 1988. Four surveyors worked one of two eight hour shifts (6:00 AM to 2:00 PM; 1:00 PM to 9:00 PM) which encompassed all daylight hours. The study period was stratified into weekday and weekend/holiday day types, with assessment of 10 of the 16 open days. Access point surveyors were stationed at Beaver Bridge, Haggen Creek and Km 80, the sites of maximum expected angler effort. A roving

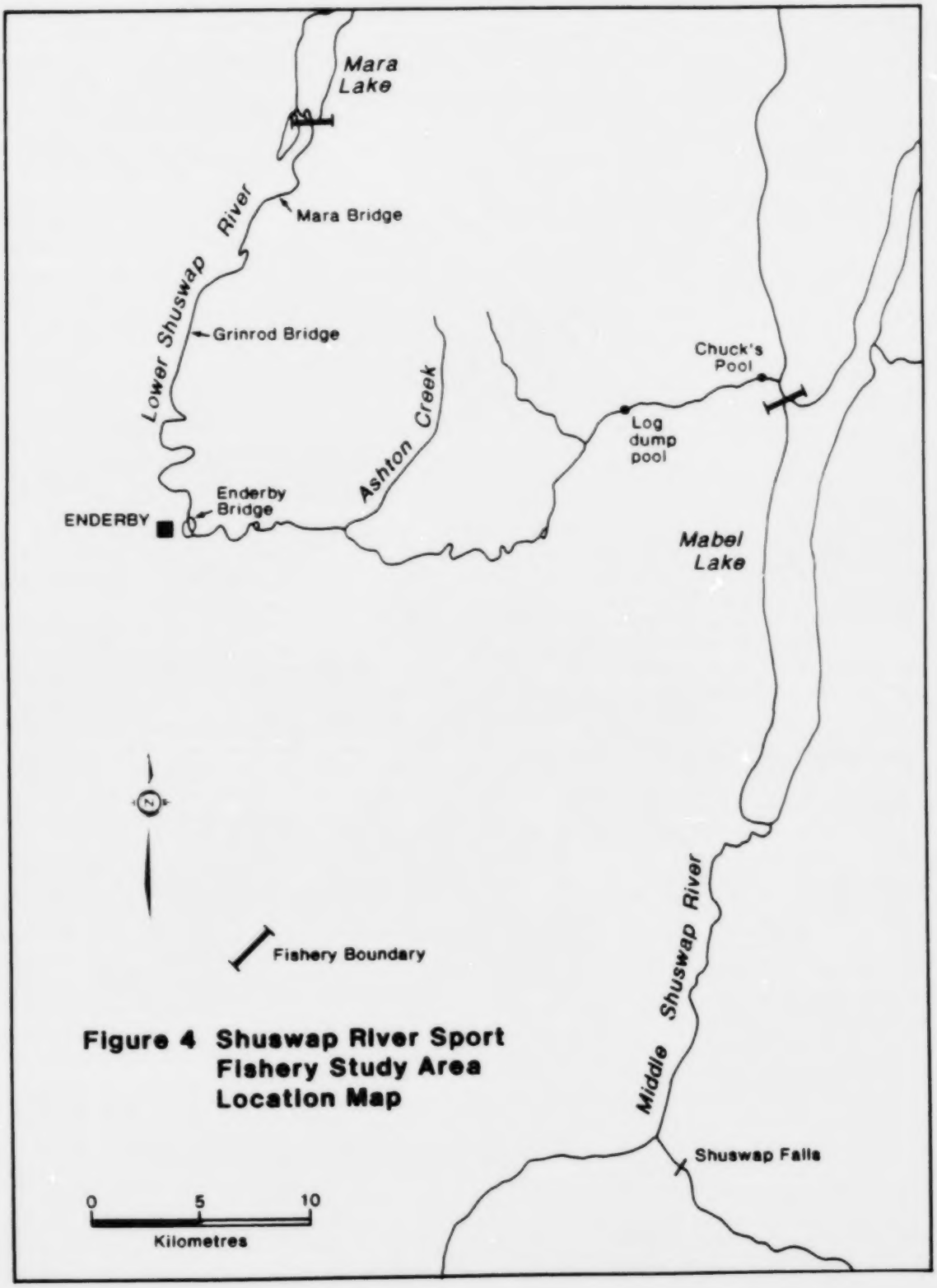

Figure 4 Shuswap River Sport Fishery Study Area Location Map

surveyor assessed the remaining sites.

Upon arrival at the site access, the surveyors requested that anglers report for an interview at the end of their fishing trip and, on the morning shift, inquired if any anglers had left before 6:00 AM. The surveyors then remained at the site access to conduct hourly angler counts and exit interviews. At the end of the evening shift, any anglers still fishing were interviewed. Each interview recorded angler trip length (to time of interview and expected additional time, if any), target species, number and species harvested or released, identifying marks on harvested fish (fin or maxillary clip), gear type and, if the angler had fished the Bowron River within two weeks, trip duration and harvest on the most recent trip. When possible, harvest was inspected to confirm species and mark identification. An interview form was completed for each angler; however, if the angler was unresponsive or if response reliability was questionable, the form was voided.

The roving surveyor travelled a predetermined route by automobile, with a randomly selected start point and direction of travel. The surveyor's rate of travel through the fishery was standardized to ensure that a complete circuit encompasses seven hours. Anglers were approached on foot and interviewed as above. In addition to the interviews, the surveyor conducted a one hour instantaneous rod count of the entire study area during the period of expected peak daily angler effort (1:00 PM to 1:59 PM). No interviews were conducted during the rod count.

Bridge River

The Bridge River sport fishery was assessed by complete census on May 24, 1988. The fishery was terminated after that date due to a conflict between the sport fishermen and members of the Bridge River Indian Band. One surveyor worked a 12 hour shift (8:00 AM to 8:00 PM) encompassing the entire daily open period. Because the open area was small and limited to a single commonly used access trail, the surveyor was able to census the entire fishery. Daily procedures were identical to those described for the Bowron river, with three exceptions: instantaneous angler counts were not required; size (nose-fork length and weight), flesh colour, sex and adipose condition and scale samples were obtained from all harvested chinook salmon; and anglers were not questioned regarding previous trip duration.

Quesnel River

The upper Quesnel River sport fishery was assessed, using a roving design, between August 6 and September 10, 1988. A single surveyor, working one of two eight hour shifts (6:00 AM to 2:00 PM; 1:00 PM to 9:00 PM), surveyed all open days. Procedures were similar to those described for the Bowron River, except instantaneous rod counts were conducted at randomly selected times during the period of expected maximum angler effort (1:00 PM to 6:00 PM).

Shuswap River

The Shuswap River sport fishery was assessed, using a hybrid design, between August 24 and September 7, 1988. Three surveyors worked one of two eight hour shifts (5:00 AM to 1:00 PM; 1:00 PM to 9:00 PM). The study period was stratified into weekday and weekend/holiday day types, with assessment of 10 days of the 15 day open period. Surveyors were stationed at Chuck's and Log Dump pools, the areas of maximum expected angler effort, while a roving surveyor assessed the remaining areas. Daily procedures were identical to those described for the Bowron River, except instantaneous rod counts occurred

during the two periods of expected daily effort maxima (6:00 AM to 7:30 AM on the morning shift; 7:00 PM to 8:30 PM on the afternoon shift).

Thompson River

The Thompson river sport fishery was assessed by complete census between July 22 and August 26, 1988. Surveyors worked a 12 hour shift (8:00 AM to 8:00 PM) encompassing the entire daily open period. Surveyors were stationed at the two main fishing sites, on the east bank at the Nicola River mouth and on the west bank opposite the Nicola River. Because the entire open area was within sight of the Nicola River mouth, a secondary surveyor was able to contact any anglers not fishing at these sites before they left the river. Daily procedures were identical to those described for the Bowron river, except instantaneous rod counts were not required and the chinook harvest was sampled for size (nose-fork length and weight), flesh colour, sex, adipose condition and scales.

DATA MANAGEMENT

Data storage and analysis were conducted on an IBM-AT compatible micro-computer. A custom designed data entry program (DPA Group Inc. MS 1985a) was used to generate ASCII files. The hybrid survey files were then imported into a custom designed analysis program (DPA Group Inc. MS 1986), while the roving survey files were imported into a spreadsheet program for analysis.

The data were verified in three steps. First, all field data sheets were examined to ensure compliance with study procedures. Second, the data entry program performed 31 automatic error checks, including duplication detection, code validity, and range and consistency verification. Third, the ASCII data files were imported to a spreadsheet program for final verification with the field data sheets.

DATA ANALYSES

Bowron River

Angler Effort: Profiles of daily angler effort were generated from hourly rod counts at Beaver Bridge, Km 80 and Haggen Creek, with effort before 6:00 AM and after 9:00 PM reconstructed from interview data. Hourly effort was weighted to compensate for the sampling imbalance which resulted from overlapping survey shifts.

Mean sample-day angler effort (hours) was calculated for each stratum by dividing the mean rod count (from access point and roving surveys) by the proportion of daily effort occurring during the rod count time block (1:00 PM to 1:59 PM). Total angler effort was the product of the mean daily angler effort and the number of days in the stratum. The mathematical relationships are reported below. Variance calculations are detailed in Appendix 19.

1) Estimated total rods fishing ($\hat{R}_{hj}$), by hour and day type (weekday or weekend/holiday):

$$\hat{R}_{hj} = \sum_i N_h / n_{hij} \sum_k r_{hijk}$$

2) Estimated proportion of daily angler effort occurring during the instantaneous rod count time block ($\bar{p}_{hj}^*$), by day type:

$$\bar{p}_{hj}^* = \frac{\hat{R}_{hj}^*}{\sum_j R_{hj}}$$

3) Estimated mean rod count during the instantaneous rod count time block ($\bar{y}_{hj}^*$), by day type:

$$\bar{y}_{hj}^* = \sum_k \frac{y_{hj}^*{}_k}{n_{hj}^*}$$

4) Estimated angler effort (E_h), by day type, in hours:

$$E_h = N_h \frac{\bar{y}_{hj}^*}{\bar{p}_{hj}^*}$$

5) Estimated study period angler effort (E), in hours:

$$E = \sum_h E_h$$

where:

- N_h = total days of day type h (weekday or weekend/holiday) in the study period,
- n_{hij} = number of interview sample days on day type h at site i during hour j,
- r_{hijk} = rod count on day type h at site i at hour j on day k,
- $\hat{R}_{hj}^*$ = estimated total effort (hours) on day type h during the instantaneous rod count time block (j*),
- $y_{hj}^*{}_k$ = instantaneous rod count on day type h at all sites (access point and roving surveys) on day k,
- n_{hj}^* = number of instantaneous rod counts on day type h at hour j*.

Catch Per Unit Effort: CPUE was calculated by species and mark group using a total ratio estimator (Von Geldern, Jr. and Thomlinson 1973; Malvestuto 1983), i.e. for the surveyed sites (Beaver Bridge, Haggen Creek, Km 80 and roving), the total estimated catch was divided by the total estimated effort (to time of interview). Estimates were derived from interview data weighted by the proportion of study period stints which were surveyed (for the purpose of analyses, the day was divided into three stints: 6:00 AM to 1:00 PM; 1:00 PM to 2:00 PM; and 2:00 PM to 9:00 PM) to account for sampling imbalances resulting from overlapping survey shifts and, for access point sites, by the proportion of anglers in each hour who left the site without an interview. CPUE was calculated separately for harvested (HPUE) and released (RPUE) fish; however, separate RPUEs were not calculated for unmarked and marked fish because angler mark recognition was considered unreliable. The mathematical relationships are reported below.

6) Estimated study period catch to time of interview at the survey sites ($\hat{x}_h$), by day type:

$$\hat{x}_h = \sum_i \sum_l \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{x_{hilfqu}}{a_{hilfq}}$$

7) Estimated study period angler hours to time of interview at the survey sites ($\hat{t}_h$), by day type:

$$\hat{t}_h = \sum_i \sum_l \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{t_{hilfqu}}{a_{hilfq}}$$

8) Estimated catch per angler hour at the survey sites ($\bar{c}_h$), by day type:

$$\bar{c}_h = \frac{\hat{x}_h}{\hat{t}_h}$$

where:

a_{hil} = proportion of total study period stints of type 1 for site i on day type h which were surveyed,

a_{hilfq} = proportion of anglers leaving in time block q on stint f of stint type 1 at site i on day type h who were interviewed,

x_{hilfqu} = catch to time of interview by angler u leaving in time block q on stint f of stint type 1 at site i on day type h,

t_{hilfqu} = hours fished to time of interview by angler u leaving in time block q on stint f of stint type 1 at site i on day type h.

Before calculating CPUE, the raw interview data were tested for significant differences in CPUE between all interviews and complete trip interviews. The test used, from Cochran (1977), was:

9) Estimated variance of the difference between two ratios ($Var(\bar{c}_c-\bar{c}_t)$):

$$Var(\bar{c}_c-\bar{c}_t) = Var\ (\bar{c}_c) + Var(\bar{c}_t)$$

where:

$Var(\bar{c}_c)$ = variance of CPUEs from complete trip interviews:

$$\frac{1}{n(n-1)\bar{t}^2} \sum x_u^2 - 2\bar{c}_c \sum x_u t_u + \bar{c}_u^2 \sum t_u^2$$

$Var(\bar{c}_t)$ = variance of CPUEs from all interviews, calculated as above.

$\bar{t}$ = mean time to interview.

If $(\bar{c}_c-\bar{c}_t)\pm$(t-table, 0.95) $(Var(\bar{c}_c-\bar{c}_t))$ did not include zero, the difference was significant. If a significant difference in CPUEs was noted, incomplete trip interviews were excluded from analysis for that site. If a significant difference in CPUEs was noted between sites, then equations 6, 7 and 8 were replaced with the following:

10) Estimated total catch to time of interview ($\hat{x}_{hi}$), by site and day type:

$$\hat{x}_{hi} = \sum_1 \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{x_{hilfqu}}{a_{hilfq}}$$

11) Estimated total angler hours to time of interview ($\hat{t}_{hi}$), by site and day type:

$$\hat{t}_{hi} = \sum_1 \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{t_{hilfqu}}{a_{hilfq}}$$

12) Estimated catch per angler hour ($\bar{c}_{hi}$), by site and day type:

$$\bar{c}_{hi} = \frac{\hat{x}_{hi}}{\hat{t}_{hi}}$$

13) Estimated mean catch per angler hour at all sites (weighted by site angler effort) ($\bar{c}_h$), by day type:

$$\bar{c}_h = \frac{\sum_i \bar{c}_{hi}\ E_{hi}}{\sum_i E_{hi}}$$

where:

$$E_{hi} = N \frac{\bar{y}_{hij}^*}{\bar{p}_{hj}^*}$$

= estimated total angler effort at site i on day type h,

$\bar{y}_{hij}^*$ = mean rod count at site i on day type h during the instantaneous rod count time block.

Harvest and Release: Total harvest and release, estimated by species and mark group, was the sum of individual estimates for the weekday and weekend/holiday strata. For each stratum, harvest and release was the product of stratum effort and the corresponding value of HPUE or RPUE.

14) Total study period catch (C):

$$C = \sum_h \bar{c}_h \; E_h$$

Harvest Rate: In all study areas, the harvest rate of chinook adults was calculated by dividing the estimated harvest by the sum of the estimated harvest and the observed escapement (provided by field staff). Harvest rates were not calculated for other species because total abundance was unknown.

Angler Characteristics: In all study areas, the following unweighted angler attributes were summarized by site and day: mean angler day length, by weather type (clear, overcast and rain), mean angler day length from complete and incomplete trip interviews, numbers of anglers targeting on each species and preferred gear type. Mean angler day length, for the open period, calculated from complete trip interviews only, was estimated from site-specific data weighted by estimated angler effort.

Bridge River

Because the Bridge River study was a complete census, angler effort, CPUE and catch were measured directly: angler effort was the sum of the observed hours fished by all anglers; catch was the sum of the observed catch to time of interview; and CPUE was the ratio of catch and angler effort. The mathematical relationships are reported below.

15) Total angler effort (E) in hours:

$$\sum_{j=900}^{2000} \frac{\sum_k r_{kj} + \sum_k r_{kj-1}}{2}$$

16) Total study period catch (C);

$$C = \sum_u x_u$$

17) Total catch per angler hour ($\bar{c}$):

$$\bar{c} = C/E$$

Quesnel River

Angler Effort: A profile of hourly angler effort was generated from angler interview data, with hourly effort weighted to compensate for sampling imbalances resulting from overlapping survey shifts and random effort counts. A single profile was used for both weekend/holiday and week days because the number of interviews was inadequate to generate seperate profiles.

Total sample day angler effort (hours) was calculated for each stratum (weekday or weekend/holiday) by dividing the rod count by the propor-

tion of the daily effort occurring in that time block. Rod counts were conducted during the period of maximum expected effort, but scheduled to ensure that at least two interview shifts occurred in each hourly time block. Mean daily angler effort (and its variance) was calculated for each stratum. Stratum totals were the product of the mean daily angler effort and the number of days in each stratum. Total angler effort and associated variance was produced by combining stratum totals and variances. The mathematical relationships, based on Mendenhall et al. (1971), were:

18) Estimated stratum mean daily effort ($\bar{e}_h$), in hours:

$$\bar{e}_h = (\sum_k y_j{}^*{}_k / \bar{p}_j{}^*) / n_j{}^*$$

19) Total study period angler effort (E) and variance (Var(E)), all in hours:

$$E = \sum_h \bar{e}_h \; N_h$$

$$Var(E) = \sum_h N_h^2 \; (s_h^2/n_h) \; (fpc_h)$$

where:

- $y_j{}^*{}_k$ = instantaneous rod count at all sites on day k,
- $\bar{p}_j{}^*$ = proportion of daily angler effort (hours) during the instantaneous rod count time block (as determined from interview data),
- $n_j{}^*$ = number of instantaneous rod counts at hour j*,
- N_h = number of days in stratum h,
- s_h = sample variance in stratum h,
- fpc_h = finite population correction for stratum h.

Catch Per Unit Effort: CPUE was calculated by species and mark group for each stratum using a total ratio estimator. In general, CPUE was estimated as described for the Bowron River, except observed catch and effort to time of interview were used, and the data were not weighted by the proportion of anglers leaving without being interviewed. CPUEs and their variances were calculated as follows:

20) Catch per unit effort ($\bar{c}$):

$$\bar{c} = \sum_1 \frac{w_1 (\sum_u x_u / \sum_u t_u)}{\sum_1 w_1}$$

21) Variance of CPUE (Var($\bar{c}$))

$$Var(\bar{c}) = (1/\bar{t}^2) \sqrt{\frac{\sum_u ((x_u - \bar{c}) t_u)^2}{n(n-1)}}$$

where:

- x_u = catch to time of interview of angler u,
- t_u = hours fished to time of interview by angler u,
- $\bar{t}$ = mean time spent angling to time of interview,
- n = number of anglers interviewed in stratum,
- w_1 = proportion of stints of type 1 which were surveyed.

Harvest and Release: Total harvest and release, by species and mark group, was calculated as in Equation 14. Variance was calculated as follows:

22) $Var(C) = E \; Var(\bar{c}) + \bar{c} \; Var(E) + Var(E) Var(\bar{c})$

Shuswap River

Lower Shuswap River data were analysed using the procedure described for the Bowron River study. Angler effort was calculated from the profile observed at Chuck's and Log Dump pools and from instantaneous counts from the roving, Chuck's Pool and Log Dump Pool surveys. CPUE was generated from information collected at Chuck's and Log Dump pools and by the roving survey.

Thompson River

Thompson River data were analyzed using the procedure described for the Bridge River study. Data from the East and West banks were treated seperately and summed to produce fishery results.

RESULTS

Study results for the five upper Fraser River chinook sport fisheries are summarized in Tables 2, 3 and 4. Based on 1,585 interviews, an estimated 22,692 angler hours (5,593 angler days) were expended to harvest (release) 413 (65) chinook adults, 48 (25) chinook jacks, 156 (395) rainbow trout (**Oncorhynchus mykiss**), 0 (2) steelhead trout (**O. mykiss**), 24 (33) Dolly Varden char (**Salvelinus malma**), 24 (32) whitefish (**Prosopium sp.**), 30 (57) squawfish (**Ptychocheilus oregonensis**) and 0 (4) suckers (**Catostomus sp.**). Chinook adult harvest rates ranged from 0.02% to 2.63%.

With the exception of the upper Quesnel River, the 1988 fisheries were successful in attracting anglers primarily interested in harvesting chinook salmon. The average angler fished for 3.2 to 4.8 hours per day using bait, lures or a combination of the two; few fished with flies. The average angler expended 11.8 to 83.1 hours to harvest one chinook adult. Results by study area are detailed below.

BOWRON RIVER

Effort Distribution

Four hundred and forty-four anglers were interviewed on 10 survey days during the 16 day study period (Appendix 1). Of that total, 139 were interviewed at Beaver Bridge, 81 at Km 80, 132 at Haggen Creek and 92 in the remaining areas. Instantaneous rod counts were conducted each survey day (Appendix 2); however, the area between the Bowron and Beaver Forest Road bridges was not surveyed due to expected low angler effort. Angling occurred primarily at road access points, although some anglers accessed the fishery by boat or over extended distances on foot.

Angler Effort

Daily Profile: Anglers fished from 1:00 AM to 11:00 PM, with 80% of the effort occurring from 9:00 AM to 5:00 PM (Appendix 3; Fig. 5). Weekday effort peaked at 11:00 AM, while weekend effort started earlier and peaked at 2:00 PM.

Total Angler Effort: Study period angler effort totaled 5,804 angler hours or 1,209 angler days (Table 2), of which 53% occurred on weekend or holiday days. Thirty-three percent of the effort occurred at Beaver Bridge, 32% at Haggen Creek and 16% at Km 80, with most of the remainder in regions 5 and 8 (Appendix 2).

Catch Per Unit Effort

Harvest: Weighted chinook adult HPUE, expressed as fish per hour, was estimated at 0.0181. Incomplete trip interview bias was not noted. Overall, HPUE was higher on weekend (0.0220) compared to week days (0.0135) and was highest at Km 80 and Haggen Creek (Appendix 4). The maxi-

Table 2. Summary of harvest, release and angler effort in the 1988 upper Fraser River sport fisheries (95% confidence limits in parentheses).

	Bowron River	Bridge River	Quesnel River	Shuswap River	Thompson River	All areas
Numer of interviews	444	45	121	660	315	1,585
Angler effort (hour)	5,804.0	147.5	1,163.5	14,288.0	1,288.8	22,692
Angler effort (day)	1,209.2	45.0	363.6	3,663.6	312.1	5,593
Harvest						
Chinook adult	105 (42)[a]	11 -	14 (16)	174 (274)[b]	109 - [c]	413
Chinook jack	2 (2)	0 -	0 -	44 (56)	2 - [d]	48
Rainbow	43 (30)	0 -	113 -	0 -	0 -	156
Dolly Varden	16 (12)	0 -	8 (12)	0 -	0 -	24
Whitefish	17 (16)	0 -	7 (15)	0 -	0 -	24
Squawfish	0 -	0 -	0 -	30 (36)	0 -	30
Release						
Chinook adult	12 (14)	0 -	0 -	0 -	53 -	65
Chinook jack	2 (2)	0 -	3 (8)	20 (30)	0 -	25
Rainbow	80 (32)	3 -	312 (211)	0 -	0 -	395
Steelhead	0 -	2 -	0 -	0 -	0 -	2
Dolly Varden	29 (20)	1 -	3 (8)	0 -	0 -	33
Whitefish	18 (14)	0 -	14 (20)	0 -	0 -	32
Squawfish	0 -	0 -	0 -	57 (80)	0 -	57
Sucker	0 -	4 -	0 -	0 -	0 -	4

[a] Includes 5 with adipose fin clips.
[b] Includes 17 with adipose fin clips.
[c] Includes 14 with adipose fin clips.
[d] Includes 1 with an adipose fin clip.

Table 3. Summary of angler characteristics in the 1988 upper Fraser sport fisheries. [a]

	Bowron River	Bridge River	Quesnel River	Shuswap River	Thompson River
Mean angler day length (hour)	4.8	3.3	3.2	3.9	4.1
Target species					
Chinook	80.4	100.0	40.5	99.4	100.0
Trout [b]	3.4	0.0	37.2	0.6	0.0
Anything	16.2	0.0	22.3	0.0	0.0
Gear (%)					
Bait	6.6	86.0	44.6	20.6	68.8
Lure	75.6	9.3	33.9	46.8	20.7
Bait/Lure	17.8	4.7	12.4	32.7	10.5
Fly	0.0	0.0	9.1	0.0	0.0

[a] Angler day length is weighted; all other data are unweighted.
[b] Includes rainbow, whitefish or Dolly Varden.

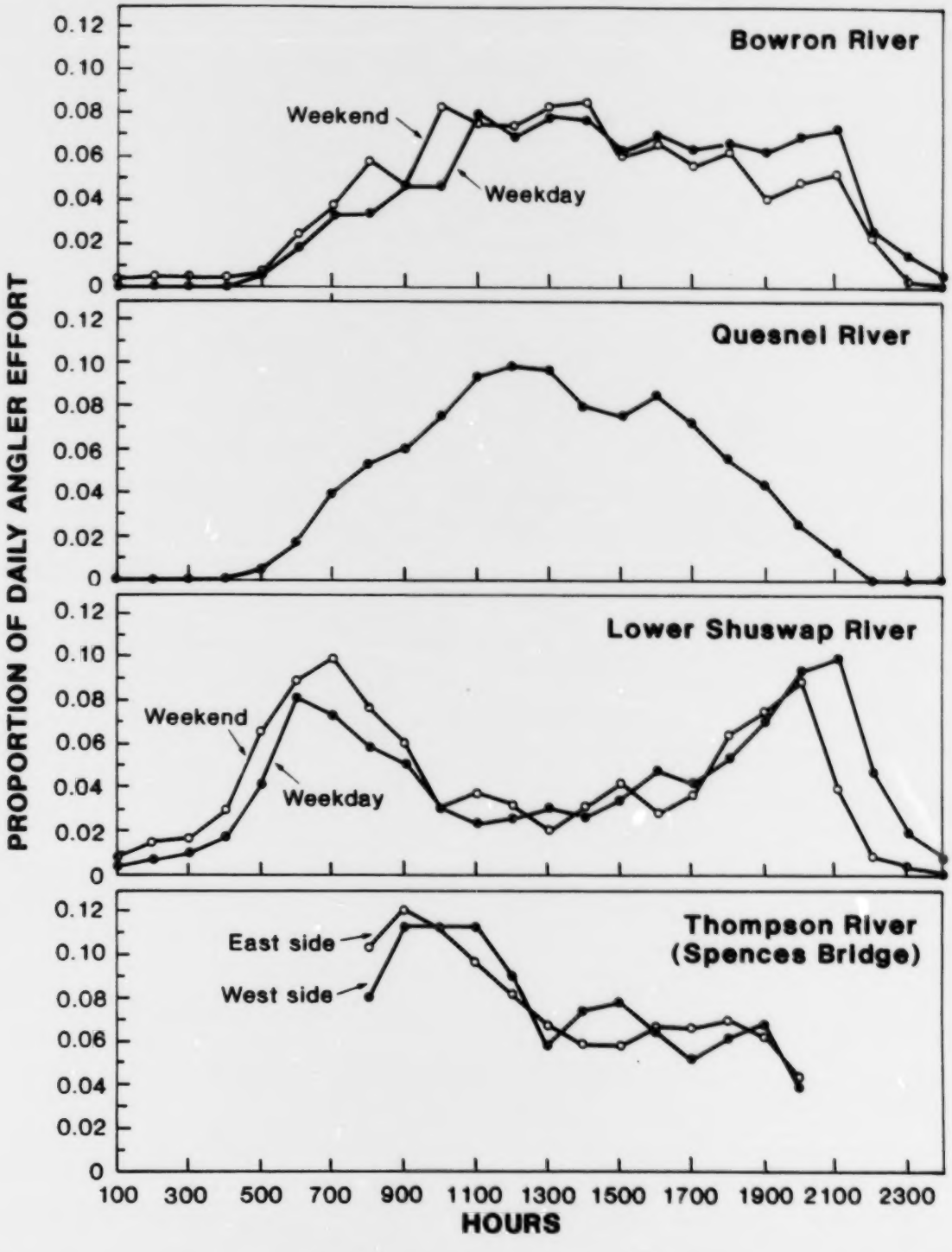

Figure 5 Hourly angler effort profiles in the upper Fraser River, 1988

mum daily HPUE of 0.294 was recorded at Beaver Bridge on July 31.

Release: Chinook adult RPUE was estimated at 0.0021. RPUEs for other species are reported in Appendix 4.

Harvest

Harvest was estimated at 105 chinook adults, 2 chinook jacks, 43 rainbow trout, 16 Dolly Varden char and 17 whitefish (Table 2). Five of the harvested chinook were missing an adipose fin.

Release

An estimated 12 chinook adults, 2 chinook jacks, 80 rainbow trout, 29 Dolly Varden char, 18 whitefish and 54 unidentified fish were intentionally released in 1988 (Table 2).

Angler Characteristics

Angler day Length: Anglers fished an average 4.8 hours per trip (Table 3). Angler day length averaged 4.3, 4.6 and 5.4 hours on clear, overcast and rainy days, respectively.

Target Species: Anglers attempted to harvest chinook (80%), Dolly Varden or rainbow (3%) or anything (16%) (Table 3).

Gear Type: Lures were the most commonly used gear (76%), followed by bait/lure combinations (18%). Less than 7% of the anglers used bait, and none used flies (Table 3).

Previous Trip: Forty-seven percent of the anglers interviewed had fished for chinook in the Bowron River on at least one other day in 1988 (Appendix 17). Chinook adult HPUE on the most recent trip averaged 0.0231.

BRIDGE RIVER

Effort

Forty-five anglers were interviewed on May 24, the initial day of the Bridge River sport fishery (Appendix 5). Angler effort totaled 147.5 hours (45 angler days)(Table 2) and was was bimodal, with peaks at 10:00 AM and 7:00-8:00 PM (Appendix 3). The fishery was terminated after the first day in response to a land ownership claim by the Bridge River Indian Band.

Catch Per Unit Effort

Only chinook adults were harvested in 1988, at a HPUE of 0.0746. RPUE totaled 0.0136 for steelhead trout, 0.0203 for rainbow trout, 0.0068 for Dolly Varden and 0.0271 for suckers.

Harvest

Eleven chinook adults were harvested in 1988. Overall size averaged 76.5 cm and 6.6 kg (Appendix 6). The harvest consisted of ages 6_2 (12.5%), 5_2 (50.0%) and 4_2 (37.5%).

Release

Release totaled 2 steelhead trout, 3 rainbow trout, 1 Dolly Varden char and 4 suckers (Table 2).

Angler Characteristics

Anglers fished an average 3.3 hours, predominantly using bait (86%). All anglers were attempting to harvest chinook (Table 3).

QUESNEL RIVER

Effort Distribution

One hundred and twenty-one anglers were interviewed during the eleven day study period (Appendix 7).

Instantaneous rod counts were conducted each open day (Appendix 8). Angling occurred at road access points with anglers observed near the Quesnel Lake outlet (the "Narrows") and downstream from Likely. None were observed between Likely and the Narrows.

Angler Effort

Daily Profile: Anglers fished from 5:00 AM to 9:00 PM, with 80% of the effort occurring from 9:00 AM to 6:00 PM (Appendix 3; Fig. 5). Effort peaked at noon. Insufficient data were available to generate separate profiles for weekend/holiday and weekdays.

Total Angler Effort: Study period angler effort totaled 1,164 hours or 364 angler days (Table 2), of which 58% occurred on weekend or holiday days. Angler effort on the average weekday (98 hours) was approximately 87% of that on the average weekend or holiday day (112 hours).

Catch Per Unit Effort

Harvest: Weighted chinook adult HPUE was estimated at 0.0124. Incomplete trip interview bias was not noted. HPUE's for other species are reported in Appendix 9.

Release: No chinook adults were released in 1988. RPUE's for other species are reported in Appendix 9.

Harvest

Harvest was estimated at 14 chinook adults, 113 rainbow trout, 8 Dolly Varden char and 7 whitefish (Table 2).

Release

An estimated 3 chinook jacks, 312 rainbow trout, 3 Dolly Varden char and 14 whitefish were voluntarily released in 1988 (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished an average 3.2 hours per trip (Table 3). Angler day length averaged 3.3, 2.5 and 3.3 hours on clear, overcast and rainy days, respectively.

Target Species: Anglers attempted to harvest chinook (41%), rainbow (37%) or anything (22%) (Table 3).

Gear Type: Bait was the most commonly used gear (45%), followed by lures (34%), bait/lure combinations (12%) and flies (9%) (Table 3).

Previous Trip: Twenty-one percent of the anglers interviewed had fished for chinook in the Quesnel River on at least one other day in 1988 (Appendix 17). Chinook adult HPUE on the most recent trip averaged 0.0370.

SHUSWAP RIVER

Effort Distribution

Six hundred and sixty anglers were interviewed during the 15 day study period (Appendix 10), 228 at Chuck's Pool, 181 at Log Dump Pool and 251 in the remaining areas. Instantaneous rod counts were conducted each survey day. As reported in previous years, angling occurred near road access points throughout the lower Shuswap River. Thirty percent of the anglers were observed between Mable Lake and Skookumchuck, with a further 19% between Fall and Cooke creeks and 18% between the Enderby and Ashton Creek bridges. Few anglers were observed between Cooke Creek and Skookumchuck (Appendix 11).

Angler Effort

Daily Profile: Anglers fished the lower Shuswap River 24 hours per day (Appendix 3; Fig. 5). Effort was bimodal, with peaks at 6:00 AM and 9:00 PM on weekdays and 7:00 AM and 8:00 PM on weekends.

Total Angler Effort: Study period angler effort totaled 14,288 angler hours or 3,664 angler days (Table 2). Thirty-eight percent of the effort occurred at Chuck's Pool, 30% at Log Dump Pool and 33% in the remaining areas.

Catch Per Unit Effort

Harvest: Weighted HPUE was estimated at 0.0122 and 0.0031 for chinook adults and jacks, respectively. Incomplete trip interview bias was not noted. Weekday chinook adult HPUE was highest at the roving sites (0.0242) while weekend HPUE was highest at Chuck's Pool (0.0054) (Appendix 12).

Release: Chinook adults were not released in 1988. Chinook jack RPUE was estimated at 0.0014. RPUE for other species is reported in Appendix 12.

Harvest

Harvest was estimated at 174 chinook adults (including 17 with adipose fin clips), 44 chinook jacks and 30 squawfish (Table 2).

Harvest Sampling: Sample results from the 1988 lower Shuswap River sport fishery are detailed in Appendix 13. The harvest consisted entirely of red fleshed chinook, with males comprising 52% of the sample. Overall size averaged 77.3 cm nose-fork length and 6.5 kg round weight. The harvest consisted of ages 5_1 (6.3%) and 4_1 (93.8%), with males entirely age 4_1.

Release

Release was estimated at 20 chinook jacks and 57 squawfish (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished an average 3.9 hours per trip (Table 3). Angler day length averaged 3.9 and 4.7 hours on clear and overcast days, respectively.

Target Species: Anglers attempted to harvest chinook (99%) or trout (1%) (Table 3).

Gear Type: Lures (47%) were the most commonly used gear, followed by bait/lure combinations (33%) and bait (21%) (Table 3).

Previous Trip: Seventy percent of the anglers interviewed had fished for chinook in the lower Shuswap River on at least one other day in 1988 (Appendix 17). Chinook adult HPUE on the most recent trip averaged 0.0097.

THOMPSON RIVER

Effort Distribution

Three hundred and fifteen anglers were interviewed during the six day study period (Appendix 14), 237 on the east bank, near the Nicola River mouth, and 78 on the west bank. Angling was censused, with complete angler counts each hour.

Angler Effort

Daily Profile: Regulations restricted angling to 8:00 AM to 8:00 PM. Angler effort peaked between 9:00 AM and 11:00 AM (Appendix 3; Fig. 5).

Total Angler Effort: Study period angler effort totaled 1,289 hours or 312 angler days (Table 2).

Seventy-nine percent of the effort occurred on the east bank.

Catch Per Unit Effort

Harvest: Chinook adult HPUE was 0.0958 on the east bank and 0.0434 on the west bank (Appendix 15). Chinook jack HPUE was 0.0020 on the east bank; none were harvested on the west bank.

Release: Chinook adult RPUE was 0.0523 on the east bank. None were released on the west bank (Appendix 15).

Harvest

Harvest totaled 109 chinook adults (including 14 with adipose fin clips) and 3 chinook jacks (including 1 with an adipose fin clip) (Table 2). Ninety-seven of the adults and 2 of the jacks were harvested on the east bank (Appendix 14).

Harvest Sampling: Sample results from the 1988 Thompson River sport fishery are detailed in Appendix 16. The harvest consisted primarily of females (74%) and red fleshed (98%) chinook salmon. Overall size averaged 71.0 cm nose-fork length and 4.0 kg. The harvest consisted of ages 5_2 (10%), 4_2 (73%), 4_1 (5%) and 3_1 (12%). All chinook with adipose fin clips and readable scales were age 3_1. Eleven CWTs were recovered from these fish, all Spius Creek Hatchery releases of Nicola River chinook.

Release

Release totaled 53 chinook adults (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished an average 4.1 hours per trip (Table 3). Angler day length averaged 4.0 and 3.8 hours on clear and overcast days, respectively.

Target Species: All anglers attempted to harvest chinook in 1988.

Gear Type: Bait was the most commonly used gear (69%), followed by lures (21%) and bait/lure combinations (11%) (Table 3).

Previous Trip: Fifty-two percent of the anglers interviewed had fished for chinook in the Thompson River on at least one other day in 1988 (Appendix 17). Chinook adult HPUE on the most recent trip averaged 0.0833.

DISCUSSION

GENERAL

Bowron River

The Bowron River sport fishery continued to expand in 1988, with angler effort increasing by 13% over 1987 and by almost twofold over 1986 (Table 4). Between 1986 and 1987, chinook harvest, harvest rate and HPUE increased dramatically, reflecting increased angler experience and regulation changes which permitted angling in more favorable areas and on weekends (Schubert 1989). Between 1987 and 1988, chinook harvest, harvest rate and HPUE declined by up to 14% despite increased angler effort and similar chinook abundance. This comparatively small change, relative to that observed between 1986-87, reflected the similar management plan implemented in 1988, with declines likely attributable to changes in fish behavior and environmental conditions.

Bridge River

The Bridge River sport fishery terminated after opening day; therefore, few comparisons could be made between the 1987 and 1988. It was

Table 4. Summary of harvest rate, catchability and harvest per unit effort (HPUE) in the 1988 upper Fraser River sport fisheries. [a]

Fishery	Year	Angler effort (hr)	Harvest	Escapement	Catchability coefficient ($\times 10^{-6}$)	Harvest rate (%)	Mean HPUE
Bowron River	1988	5,404	105	5,908	3.23	1.75	0.0181
	1987	4,769	121	6,000	4.15	1.98	0.0210
	1986	3,179	13	9,465	0.43	0.14	0.0041
Bridge River	1988	148	11	59,877 [b]	1.25	0.02	0.0746
	1987	2,671	115	65,344 [b]	0.66	0.18	0.0431
Quesnel River, upper	1988	1,164	14	6,550	1.83	0.21	0.0120
	1986	1,484	14	9,250	1.02	0.15	0.0116
Shuswap River, lower	1988	14,288	174	14,000	0.86	1.23	0.0122
	1987	6,071	215	10,000	3.48	2.10	0.0355
	1986	6,145	237	12,000	3.15	1.94	0.0386
Thompson River	1988	1,289	109	4,028 [c]	20.44	2.63	0.0846

[a] 1986-87 data from Schubert (1988, 1989).
[b] Sum of escapement, Indian food fishery and sport fishery harvest upstream from Bridge River.
[c] Assumes fishery harvest was entirely from main Thompson River stocks, i.e. Bonaparte, Deadman and Nicola chinook.

noted, however, that HPUE remained among the highest of the study areas, confirming that the Bridge River fishery can be an effective harvester of chinook salmon.

Quesnel River

The 1988 upper Quesnel River sport fishery again attracted minimal angler effort and, among the surveyed fisheries, was the least effective harvester of chinook salmon, requiring 83 hours to harvest one chinook adult (Table 4). While chinook catchability, harvest rate and HPUE all increased over 1986, harvest was negligible and angler effort declined by 22% despite an additional two fishing days. The upper Quesnel River was the only 1988 fishery where the majority of the anglers fished for species other than chinook salmon (Table 3). While the 1988 study results suggest intensive assessment of this fishery is not required, there were anecdotal reports of high harvest in 1987. An additional assessment year may be appropriate.

Shuswap River

The lower Shuswap River again supported the most intensive of the five upper Fraser River chinook sport fisheries, accounting for 64% of the

overall angler effort (Table 4). Angler effort increased over twofold relative to both 1986 and 1987. This reflected an increase in fishing time from five and seven days (2 days/week) in 1986 and 1987, respectively, to 15 days (7 days/week) in 1988. Despite increased angler effort and chinook abundance, however, chinook harvest, harvest rate and HPUE all declined substantially from 1987. This change may reflect a decline in chinook catchability associated with exposure to virtually continuous angler effort. Angler effort in this fishery was notable for occurring over the entire 24 hour period (Fig. 5). In 1986 and 1987, chinook were permitted a two or three day recovery period between fisheries. Decreased catchability may reflect the elimination of this recovery period in 1988.

Thompson River

The Thompson River (Spences Bridge) sport fishery was an extremely effective harvester of chinook salmon. The chinook catchability coefficient and apparent harvest rate were the highest observed in 1988. The HPUE was over double the highest ever observed in a full upper Fraser River chinook sport fishery (Table 4). An average of only 12 hours were required to harvest one chinook adult.

There are three lines of evidence which indicate the Thompson River sport fishery harvested primarily Thompson River (Bonaparte, Deadman and Nicola chinook) rather than passing North and South Thompson River chinook stocks. First, all of the coded wire tagged chinook harvested in the Thompson River fishery were of Nicola River origin, despite the presence of coded wire tags on stocks originating in the Raft, Salmon, Eagle, lower Shuswap and middle Shuswap rivers. Based on these recoveries, a subjective evaluation of adipose fin clip incidence in Nicola River chinook (N. Todd, pers. comm.) indicated that over one-half of the of the harvest was of Nicola River origin. Second, the 1988 harvest consisted predominantly of small (average 4.0 kg) age 4_2 (73%) and 3_1 (12%) chinook (Appendix 16) which were typical of main Thompson river stocks (Berry and Kahl MS 1982). Passing stocks originating from the lower Shuswap River, for example, were larger (average 6.5 kg) (Appendix 13) and predominantly age 4_1 (Berry and Kahl MS 1982). Third, coded wire tags recovered in a test fishery in the lower Fraser River (Schubert et al. 1988) indicated that main Thompson River chinook stocks migrated through the Fraser River between late April and late June. Since these stocks do not appear in the spawning tributaries until late August or early September, it is likely they hold in the Thompson River before moving into the tributaries to spawn. Such behavior would increase vulnerability to harvest, especially in fisheries near the confluence with the home stream.

INCOMPLETE TRIP INTERVIEW BIAS

An analysis of the 1987 upper Fraser River sport fisheries identified a bias associated with the use of incomplete trip interviews (interviews with anglers intending to continue fishing) (Schubert 1989). HPUE's estimated from incomplete trip interviews were significantly lower than from complete trip interviews, probably as a result of the regulation restricting angler harvest to one chinook adult per day. The exclusion of such interviews from the 1987 analysis had a substantial impact on study results, including reduced estimation precision, spatial diversity and number of species in the estimated catch.

The maximum permissible angler harvest in 1988 was increased to two chinook adults per day to address this

Table 5. Estimated chinook adult harvest per unit effort (HPUE), by interview type, in the 1988 upper Fraser River sport fisheries. [a]

Location	Interview type [b]	Number of interviews	Angler hours	Chinook adult harvest	Chinook adult HPUE [c]
Bowron River	Complete trip	234	1091.5	27	0.025
	Combined	444	1832.3	38	0.021
	Previous trip	176	1164.0	27	0.023
Shuswap River	Complete trip	215	849.5	12	0.014
	Combined	660	2281.0	25	0.011
	Previous trip	439	2466.5	24	0.010
Thompson River	Complete trip	315	1288.8	109	0.085
	Combined	315	1288.8	109	0.085
	Previous trip	140	648.5	54	0.083

[a] Upper Quesnel River was excluded due to insufficient complete trip interviews; Bridge River was excluded due to a lack of incomplete and previous trip interviews.
[b] Combined indicates complete plus incomplete trip interviews.
[c] Not weighted by day type or site.

bias. Sufficient data were available from the Bowron River and Shuswap River sport fisheries to evaluate this regulation change (Table 5). Three factors suggest the regulation change successfully corrected this bias. First, significant differences were not noted in overall HPUE's generated from complete trip versus combined interviews. Furthermore, when site specific data were examined, random differences rather than systematic biases were noted. Second, HPUE's generated from angler estimates of harvest and angling time on their most recent trip were similar to those generated from combined interviews. Results from the Thompson River fishery, where HPUE was generated from known catch and angler estimates of fishing time, suggest that these results were within the limits of recall error. Third, an assumption underlying sport fishery assessment surveys is that HPUE is independent of trip length (Malvestuto 1983). In 1987, HPUE was inversely related to trip length (Schubert 1989). In 1988, however, HPUE's in the Bowron River and Shuswap River sport fisheries were relatively independent of trip length (Appendix 18; Fig. 6). In contrast, HPUE in the Thompson River fishery, where the maximum permissible angler harvest remained one chinook adult per day, showed a pattern similar to that observed in 1987.

ESTIMATION OF ANGLER DAY LENGTH

Estimation of angler day length required the angler to accurately recall trip length to the time of

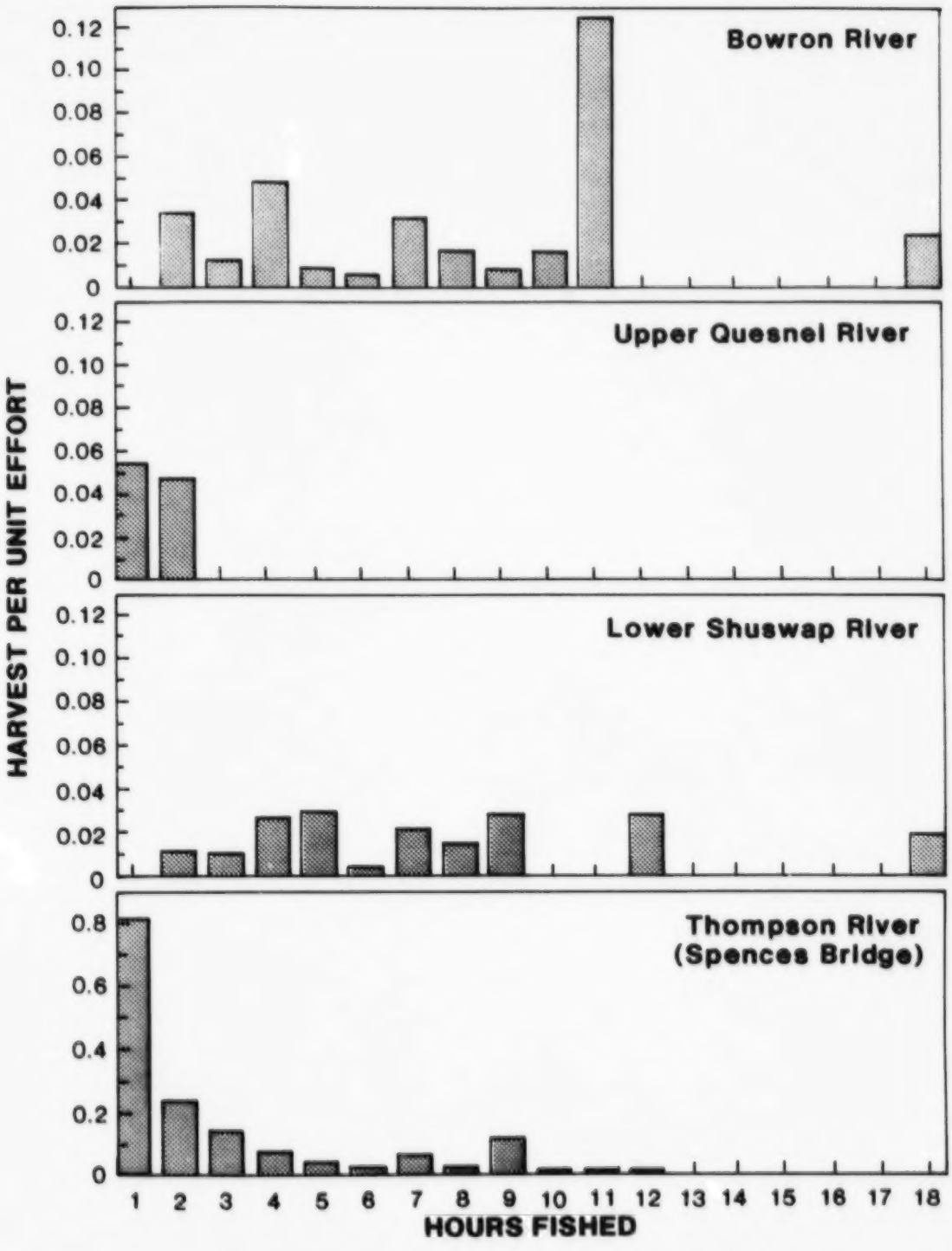

Figure 6 Harvest per unit effort of chinook adults, by angler trip duration, in four 1988 upper Fraser River sport fisheries.

interview and, if still fishing, to accurately project subsequent trip length. A difference was noted in angler day length estimated from complete and incomplete trip interviews, with the latter exceeding the former by up to four hours. Previous reports (Schubert 1988, 1989) concluded that this difference primarily reflected length of stay bias and corrected the estimate appropriately.

The ability of anglers to recall trip length and to estimate subsequent trip length was evaluated in the lower Fraser River bar sport fishery in 1989 (DFO unpublished). While anglers were able to recall trip length with reasonable accuracy, there was a large positive bias when they attempted to estimate subsequent trip length. On average, anglers overestimated subsequent trip length by almost three hours, with some anglers overestimating by as much as ten hours. Only 9% of the anglers underestimated subsequent trip length.

On the basis of the above, incomplete trip interviews were not used in the estimation of angler day length in 1988. While between year comparisons of angler hour estimates are valid, 1986-87 angler day length estimates should be corrected as above before being compared to the 1988 estimates.

RECOMMENDATIONS

1. The 1988 sport fishery regulations were successful in constraining harvest to levels well below the fishery harvest ceilings. Contingent upon stock strength, regulations could be further relaxed in the Bowron, upper Quesnel and lower Shuswap fisheries without exceeding fishery ceilings.

2. The Thompson River (Spences Bridge) sport fishery was an extremely efficient harvester of chinook salmon. In view of the disproportionate impact of this fishery on main Thompson River chinook stocks, future fisheries must be constrained to prevent negative impacts on plans to rebuild those stocks.

3. Structured fishery assessment studies should continue in the following areas: upper Quesnel River, as a final evaluation of the stability of that fishery; lower Shuswap River, due to the large angler response and the effectiveness of the fishery; and Thompson River (Spences Bridge), due to the effectiveness of the fishery. Further evaluations are also required on fisheries in the Clearwater River, which has not been monitored since 1986, and the South Thompson River, which has been evaluated only once.

SUMMARY

1. Sport fishery assessment studies were conducted in the Bowron, Bridge, upper Quesnel, lower Shuswap and Thompson (Spences Bridge) rivers in 1988. Each fishery was managed to an individual harvest ceiling through regulation of fishing time and daily and annual angler harvest. The Thompson River fishery was a new fishery in 1988, while the Bridge River fishery opened for the second consecutive year. The other fisheries have been open since 1986. Each fishery was managed in a manner similar to the previous year, except fishing time in the lower Shuswap fishery increased from two to seven days per week and from 7 to 15 days in duration.

2. The fisheries were assessed using a complete census (Bridge and Thompson rivers), roving survey (upper Quesnel River) or hybrid survey (Bowron and lower Shuswap rivers). The hybrid survey design included both access point and roving surveys.

3. Each fishery was assessed by one to four surveyors, depending on the extent of the open area and the expected angler effort. The surveyors recorded the following information during 1,585 interviews: length of time angling, target species, number and species of fish harvested or released, identifying marks on harvested fish and gear type. In addition, if the angler had fished the river in the last two weeks, the interviewer recorded the number of previous trips in 1988 and, on the most recent trip, the harvest and length of time angling.

4. Study area angler effort was estimated at 22,692 angler hours or 5,593 angler days. Of that total, 5,804 hours were spent on Bowron River, 148 at Bridge River, 1,164 on upper Quesnel River, 14,288 on lower Shuswap River and 1,289 on Thompson River. Most anglers targeted on chinook salmon.

5. Study area harvest totaled 413 chinook adults, 48 chinook jacks, 156 rainbow trout, 24 Dolly Varden char, 24 whitefish and 30 squawfish. Of the chinook adult harvest, 105 were from Bowron River, 11 from Bridge River, 14 from upper Quesnel, 174 from lower Shuswap River and 109 from Thompson River. A total of 36 chinook adults had adipose fin clips, 5 in Bowron River, 17 in Shuswap River and 14 in Thompson River.

6. Study area release totaled 65 chinook adults, 25 chinook jacks, 395 rainbow trout, 2 steelhead trout, 33 Dolly Varden char, 32 whitefish, 57 squawfish and 4 suckers. Chinook adults were released in the Bowron River (12) and Thompson River (53) fisheries.

7. Harvest rates ranged from 0.02% to 2.63%. The highest harvest rate was recorded in the Thompson River fishery.

8. An increase in the maximum permissible angler harvest from one to two chinook per day apparently corrected the negative bias noted in HPUE's estimated from incomplete trip interviews in 1987. All interviews were used to estimate HPUE in 1988.

ACKNOWLEDGMENTS

Field work was conducted by D. Baird, N. Brooks, D. Cadden, S. Harwood, L. Hughes, D. Speer and D. O'Reilly, among others. Figures were drafted by S. Gramchuk. The manuscript was prepared for publication by L. Currie and C. McPhearson.

The assistance of members of the following organizations is gratefully acknowledged: the Carrier-Sekani Tribal Council for assistance with the Bowron River survey; the Quesnel River Hatchery, especially R. Dickson, for assistance with the Quesnel River survey; the Kingfisher Fish and Game Club for assistance with the lower Shuswap River survey; and the Spences Bridge residents and Spius Creek Hatchery staff, especially N. Todd, for assistance with the Thompson River survey. Special thanks are extended to the anglers of the Bowron, upper Quesnel, Bridge, lower Shuswap and Thompson sport fisheries for providing

the information which formed the basis for this study.

LITERATURE CITED

Berry, F.C. and A.L. Kahl. MS 1982. Catalogue of selected Fraser and Thompson River tributaries important to chinook and coho salmon and a preliminary assessment of their enhancement potential. Prepared for Dept. Fish. Oceans, New Westminster by Schultz International Ltd. 227 p.

Cochran, W.G. 1977. Sampling techniques, third edition. John Wiley & Sons, New York.

DPA Group Inc. MS 1985a. Fraser River bar sport fishing survey data entry system. Prepared for the Department of Fisheries and Oceans, New Westminster. 25 p.

DPA Group Inc. MS 1985b. The Fraser River bar sport fishery design study. Prepared for the Department of Fisheries and Oceans, New Westminster. 63 p.

DPA Group Inc. MS 1986. Fraser River bar sport fishing survey analysis module. Prepared for the Department of Fisheries and Oceans, New Westminster. 39 p.

Malvestuto, S.P. 1983. Sampling the recreational fishery. Pages 397-419 In: Fisheries Techniques. Neilsen, L.H. and D.L. Johnson (eds.). American Fisheries Society, Bethesda, Maryland.

Mendenhall, W. L. Ott and R.L. Schaeffer. 1971. Elementary survey sampling. Duxbury Press. Belmont, California.

Schubert, N.D. 1988. An assessment of four upper Fraser River chinook salmon sport fisheries, 1986. Can. MS Rep. Fish. Aquat. Sci. 1890: 52p.

Schubert, N.D. 1989. An assessment of five upper Fraser River chinook salmon sport fisheries, 1987. Can. MS Rep. Fish. Aquat. Sci. 1983: 59p.

Schubert, N.D., P.G. Patterson and C.M. McNair. 1988. The Fraser River chinook salmon test fishery: data summary, 1980-87. Can. Data Rep. Fish. Aquat. Sci. 709: 193 p.

Von Geldern Jr., C.E. and P.K. Tomlinson. 1973. On the analysis of angler catch rate data from warmwater reservoirs. Calif. Fish and Game 59(4): 281-292.

Appendices

Appendix 1a. Summary of interview responses by day at Beaver Bridge in the 1988 Bowron River sport fishery.

	23-Jul	24-Jul	26-Jul	29-Jul	30-Jul	31-Jul	01-Aug	04-Aug	05-Aug	07-Aug	Total
Number of Interviews	16	13	9	14	17	24	0	13	18	15	139
Weather a	R	C	C	O	O	O	C	R	O	C	-
Mean Angler Day Length (hr.)											
- All anglers	5.5	4.3	2.2	3.9	3.6	4.6	-	4.0	4.3	7.2	4.5
- Complete trip interviews											
Number	16	12	9	14	14	24	0	11	18	11	129
Hours	5.5	4.1	2.2	3.9	3.3	4.6	-	3.7	4.3	5.3	4.2
- Incomplete trip interviews											
Number	0	1	0	0	3	0	0	2	0	4	10
Hours	-	7.5	-	-	5.5	-	-	5.5	-	12.4	8.5
Mean number of anglers in party	2.1	2.2	1.7	3.9	2.2	2.8	-	2.7	2.3	2.1	2.5
Target Species											
- Chinook	8	11	7	11	17	24	0	12	16	14	120
- Rainbow trout	0	0	0	0	0	0	0	0	1	0	1
- Dolly Varden	0	0	0	0	0	0	0	1	1	1	3
- Anything	8	2	2	3	0	0	0	0	0	0	15
Harvested Catch											
- Chinook adult	0	1	0	0	6	5	0	0	2	0	14
- Rainbow trout	5	2	0	2	0	1	0	0	0	0	10
- Dolly Varden	0	0	0	0	0	0	0	0	1	0	1
Released Catch											
- Chinook jack	0	0	0	0	1	0	0	0	0	0	1
- Rainbow trout	4	5	1	0	1	0	0	0	1	0	12
- Unknown	1	3	0	2	3	2	0	2	2	2	17
Inspection of Catch											
- Number	5	3	0	2	6	6	0	0	3	0	25
- Number correct	5	3	-	2	6	6	-	-	3	-	25
Gear											
- Bait	3	0	0	2	0	1	0	0	1	0	7
- Lure	4	9	6	5	10	10	0	9	15	12	80
- Bait/lure	9	4	3	6	6	13	0	3	2	3	49
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Bowron R.											
- No. who fished CN previously	0	1	3	2	10	13	0	3	6	10	48
- Mean previous trips per angler	-	1.0	1.7	1.5	2.4	1.7	-	1.3	3.7	4.4	2.6
- Mean angler day length (hr) b	-	?	7.7	5.0	5.3	5.3	-	5.0	6.2	8.8	6.1
- Harvest: b											
Chinook adult	-	1	-	-	3	4	-	-	1	2	11
Rainbow	-	-	1	1	1	-	-	-	-	1	4

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 1b. Summary of interview responses by day at Km 80 in the 1988 Bowron River sport fishery.

	23-Jul	24-Jul	26-Jul	29-Jul	30-Jul	31-Jul	01-Aug	04-Aug	05-Aug	07-Aug	Total
Number of Interviews	14	9	7	1	8	15	11	7	0	9	81
Weather a	R	C	C	O	O	O	C	R	O	C	-
Mean Angler Day Length (hr.)											
- All anglers	6.4	4.6	7.1	1.5	3.4	6.4	3.1	4.8	-	7.0	5.4
- Complete trip interviews											
Number	9	3	0	1	5	11	8	4	0	9	50
Hours	6.9	1.0	-	1.5	2.6	7.3	3.2	5.0	-	7.0	5.4
- Incomplete trip interviews											
Number	5	6	7	0	3	4	3	3	0	0	31
Hours	5.5	6.3	7.1	-	4.7	3.9	3.0	4.5	-	-	5.4
Mean number of anglers in party	2.9	2.0	3.0	1.0	1.8	2.3	2.5	2.4	-	3.1	2.5
Target Species											
- Chinook	4	9	7	1	8	15	11	4	0	9	68
- Anything	10	0	0	0	0	0	0	3	0	0	13
Harvested Catch											
- Chinook adult	1	0	0	0	2	4	1	0	0	0	8
Released Catch											
- Dolly Varden	0	1	0	0	0	0	0	0	0	0	1
Inspection of Catch											
- Number	1	0	0	0	2	4	1	0	0	0	8
- Number correct	1	-	-	-	2	4	1	-	-	-	8
Gear											
- Bait	1	0	0	1	0	0	0	0	0	0	2
- Lure	13	9	4	0	6	13	11	7	0	9	72
- Bait/lure	0	0	3	0	2	2	0	0	0	0	7
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Bowron R.											
- No. who fished CN previously	0	3	2	0	1	8	3	1	0	4	22
- Mean previous trips per angler	-	1.0	1.0	-	1.0	1.0	1.0	1.0	-	1.5	1.1
- Mean angler day length (hr) b	-	2.3	7	-	2	4.9	4.7	5	-	9.3	5.4
- Harvest: b											
Chinook adult	-	1	1	-	-	-	1	-	-	-	3
Rainbow	-	-	-	-	-	-	-	-	-	-	0

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 1c. Summary of interview responses by day at Haggen Creek in the 1988 Bowron River sport fishery.

Date:	23-Jul	24-Jul	26-Jul	29-Jul	30-Jul	31-Jul	01-Aug	04-Aug	05-Aug	07-Aug	Total
Number of Interviews	27	15	6	14	13	10	13	4	15	15	132
Weather a	R	C	C	O	O	O	C	R	O	C	-
Mean Angler Day Length (hr.)											
- All anglers	5.7	9.3	5.3	5.2	10.3	7.6	6.8	4.5	5.7	6.2	6.8
- Complete trip interviews											
Number	24	1	3	5	0	2	1	1	9	4	50
Hours	5.4	4.0	5.3	4.6	-	3.5	2.0	5.0	4.7	4.5	4.9
- Incomplete trip interviews											
Number	3	14	3	9	13	8	12	3	6	11	82
Hours	8.3	9.7	5.2	5.5	10.3	8.6	7.2	4.3	7.3	6.9	7.9
Mean number of anglers in party	2.3	1.5	2.3	2.6	1.9	1.0	1.6	1.5	2.1	1.5	1.9
Target Species											
- Chinook	2	0	6	14	13	9	13	2	15	12	86
- Rainbow trout	1	0	0	0	0	0	0	2	0	1	4
- Dolly Varden	1	0	0	0	0	0	0	0	0	1	2
- Rainbow or Dolly Varden	0	0	0	0	0	1	0	0	0	1	2
- Anything	23	15	0	0	0	0	0	0	0	0	38
Harvested Catch											
- Chinook adult	1	2	0	3	1	0	1	0	1	2	11
- Chinook adult, adipose clipped	1	0	0	0	0	0	0	0	0	0	1
- Rainbow trout	2	0	0	0	0	0	0	0	0	1	3
- Dolly Varden	0	0	0	0	4	0	0	0	0	1	5
- Whitefish	4	0	0	0	1	0	0	0	0	0	5
Released Catch											
- Chinook adult	0	0	0	1	1	0	0	0	0	0	2
- Rainbow trout	3	0	0	0	2	0	0	0	0	0	5
- Dolly Varden	0	0	0	0	6	3	0	0	0	0	9
- Whitefish	1	0	1	0	1	0	0	0	0	0	3
Inspection of Catch											
- Number	8	2	1	3	6	0	1	0	1	3	25
- Number correct	8	2	1	3	6	-	1	-	1	3	25
Gear											
- Bait	6	3	1	2	2	0	0	0	0	3	17
- Lure	20	12	5	11	11	9	13	4	15	12	112
- Bait/lure	1	0	0	0	0	1	0	0	0	0	2
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Bowron R.											
- No. who fished CN previously	0	12	3	4	12	8	7	1	7	13	67
- Mean previous trips per angler	-	1.0	1.0	2.3	1.9	1.6	1.9	1.0	2.9	3.3	2.0
- Mean angler day length (hr) b	-	8.3	4.7	7.5	6.1	6.1	5.3	2.0	8.7	4.5	6.3
- Harvest: b											
Chinook adult	-	1	-	-	1	1	-	-	-	-	3
Rainbow	-	-	-	-	1	-	-	-	-	-	1
Dolly Varden	-	-	-	-	1	-	-	-	-	-	1
Whitefish	-	2	-	-	1	2	-	-	-	-	5

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 1d. Summary of interview responses by day from the roving survey of the 1988 Bowron River sport fishery.

	23-Jul	24-Jul	26-Jul	29-Jul	30-Jul	31-Jul	01-Aug	04-Aug	05-Aug	07-Aug	Total
Number of Interviews	10	7	7	5	9	13	21	3	11	6	92
Weather a	R	C	C	O	O	O	C	R	O	C	-
Mean Angler Day Length (hr.)											
- All anglers	1.8	7.6	7.1	5.4	9.1	6.2	5.7	4.5	6.7	7.1	6.1
- Complete trip interviews											
Number	1	0	0	2	0	0	1	0	0	1	5
Hours	1.0	-	-	7.0	-	-	2.0	-	-	12.5	5.4
- Incomplete trip interviews											
Number	9	7	7	3	9	13	20	3	11	5	87
Hours	1.9	7.6	7.1	4.3	9.1	6.2	5.9	4.5	6.7	6	6.1
Mean number of anglers in party	3.8	2.1	3.0	1.8	1.4	2.1	2.0	1.7	3.4	4.3	2.5
Target Species											
- Chinook	10	6	7	4	9	10	18	3	10	6	83
- Rainbow trout	0	0	0	0	0	0	1	0	0	0	1
- Rainbow or Dolly Varden	0	0	0	1	0	0	0	0	1	0	2
- Anything	0	1	0	0	0	3	2	0	0	0	6
Harvested Catch											
- Chinook adult	0	1	0	1	0	1	1	0	0	0	4
- Chinook jack	0	0	0	0	0	0	1	0	0	0	1
- Rainbow trout	0	0	0	0	0	0	0	1	0	0	1
- Dolly Varden	0	0	0	0	1	0	0	0	0	0	1
- Whitefish	0	0	0	0	0	0	2	0	0	0	2
Released Catch											
- Rainbow trout	3	1	0	1	0	3	4	0	0	0	12
- Dolly Varden	3	0	0	0	0	0	0	0	0	0	3
- Whitefish	0	1	0	0	0	3	0	0	0	0	4
Inspection of Catch											
- Number	0	1	0	1	1	1	4	1	0	0	9
- Number correct	-	1	-	1	1	1	4	1	-	-	9
Gear											
- Bait	0	3	0	0	0	0	0	0	0	0	3
- Lure	8	2	4	1	6	13	20	2	6	5	67
- Bait/lure	2	2	3	3	3	0	1	1	4	1	20
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Bowron R.											
- No. who fished CN previously	0	0	2	3	6	7	13	2	3	6	42
- Mean previous trips per angler	-	-	1.0	3.0	3.2	2.4	2.4	1.0	6.0	2.8	2.7
- Mean angler day length (hr) b	-	-	7.0	8.0	8.7	8.1	8.2	3.5	7.7	7.2	7.8
- Harvest: b											
Chinook adult	-	-	1	1	2	2	2	1	-	1	10
Dolly Varden	-	-	-	-	-	2	-	-	-	-	2

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 2. Daily angler counts by region in the 1988 Bowron River sport fishery.

Date	Time	Region a						Total
		3	4	5	6	7	8	
23-Jul	1300-1359	8	1	5	0	0	13	27
24-Jul	1300-1359	6	3	8	0	0	6	23
26-Jul	1300-1359	5	0	17	0	0	6	28
29-Jul	1300-1359	9	0	5	0	0	5	19
30-Jul	1300-1359	13	5	10	0	0	14	42
31-Jul	1300-1359	12	1	19	0	0	28	60
01-Aug	1300-1359	0	7	18	0	0	14	39
04-Aug	1300-1359	7	1	3	0	0	4	15
05-Aug	1300-1359	6	1	17	0	0	8	32
07-Aug	1300-1359	8	4	8	0	0	16	36

a. Region 3 - upstream and downstream from Beaver Forest Road Bridge;
4 - immediately downstream from the Highway 16 Bridge;
5 - Highway 16 to Tsus Creek;
6 - Tsus Creek to Spruce Creek;
7 - Spruce Creek to BCFS Campsite;
8 - BCFS Campsite to Haggen Creek boundary.

Appendix 3. Daily angler effort profiles in the 1988 Bowron, Bridge, Quesnel, lower Shuswap and Thompson River (Spences Bridge) sport fisheries.

	Bowron River		Bridge River	Quesnel River	Shuswap River		Thompson River	
Hour	Weekday	Weekend	Total	Total	Weekday	Weekend	West side	East side
100	0.000	0.003	-	0.000	0.004	0.008	-	-
200	0.000	0.004	-	0.000	0.007	0.015	-	-
300	0.000	0.004	-	0.000	0.010	0.017	-	-
400	0.000	0.004	-	0.000	0.017	0.030	-	-
500	0.006	0.007	-	0.005	0.042	0.066	-	-
600	0.017	0.024	-	0.017	0.081	0.089	-	-
700	0.033	0.038	-	0.041	0.073	0.100	-	-
800	0.033	0.058	0.056	0.054	0.058	0.077	0.080	0.103
900	0.046	0.046	0.056	0.061	0.051	0.060	0.113	0.120
1000	0.046	0.083	0.097	0.076	0.030	0.031	0.113	0.111
1100	0.080	0.075	0.090	0.094	0.023	0.037	0.113	0.096
1200	0.070	0.074	0.090	0.099	0.026	0.032	0.090	0.081
1300	0.079	0.083	0.083	0.097	0.031	0.020	0.058	0.067
1400	0.077	0.085	0.069	0.081	0.027	0.031	0.074	0.058
1500	0.063	0.060	0.042	0.076	0.035	0.042	0.077	0.058
1600	0.070	0.066	0.049	0.086	0.048	0.028	0.064	0.066
1700	0.063	0.056	0.049	0.073	0.042	0.037	0.051	0.065
1800	0.066	0.063	0.083	0.056	0.054	0.064	0.061	0.069
1900	0.063	0.041	0.118	0.045	0.071	0.075	0.068	0.062
2000	0.070	0.048	0.118	0.026	0.094	0.090	0.039	0.043
2100	0.073	0.052	-	0.013	0.100	0.040	-	-
2200	0.026	0.023	-	0.000	0.047	0.008	-	-
2300	0.014	0.003	-	0.000	0.019	0.003	-	-
2400	0.005	0.000	-	0.000	0.007	0.000	-	-

Appendix 4. Daily catch per angler hour (harvest and release) in the 1988 Bowron River sport fishery.

	23-Jul	24-Jul	26-Jul	29-Jul	30-Jul	31-Jul	01-Aug	04-Aug	05-Aug	07-Aug	Total a Weekday	Total a Weekend
Harvest per Unit Effort (HPUE)												
Beaver Bridge												
- Chinook adult	0.000	0.019	0.000	0.000	0.112	0.294	0.000	0.000	0.026	0.000	0.0058	0.0274
- Rainbow	0.057	0.038	0.000	0.036	0.000	0.059	0.000	0.000	0.000	0.000	0.0087	0.0231
- Dolly Varden	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.0058	0.0000
Haggen Creek												
- Chinook adult	0.013	0.040	0.000	0.055	0.017	0.000	0.020	0.000	0.013	0.029	0.0265	0.0174
- Rainbow	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.0000	0.0074
- Dolly Varden	0.000	0.000	0.000	0.000	0.066	0.000	0.000	0.000	0.000	0.014	0.0000	0.0074
- Whitefish	0.027	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.0000	0.0124
Km 80												
- Chinook adult	0.015	0.000	0.000	0.000	0.100	0.044	0.035	0.000	0.000	0.000	0.0000	0.0293
Roving Survey												
- Chinook adult	0.000	0.040	0.000	0.047	0.000	0.017	0.015	0.000	0.000	0.000	0.0115	0.0129
- Chinook jack	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.0000	0.0043
- Rainbow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.105	0.000	0.000	0.0115	0.0000
- Dolly Varden	0.000	0.000	0.000	0.000	0.038	0.000	0.000	0.000	0.000	0.000	0.0000	0.0043
- Whitefish	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.0000	0.0086
Release per Unit Effort (RPUE)												
Beaver Bridge												
- Chinook jack	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.0000	0.0040
- Rainbow	0.045	0.095	0.050	0.000	0.019	0.000	0.000	0.000	0.013	0.000	0.0087	0.0303
- Unknown	0.011	0.057	0.000	0.036	0.056	0.118	0.000	0.046	0.026	0.020	0.0232	0.0327
Haggen Creek												
- Chinook adult	0.000	0.000	0.000	0.018	0.017	0.000	0.000	0.000	0.000	0.000	0.0066	0.0025
- Rainbow	0.020	0.000	0.000	0.000	0.033	0.000	0.000	0.000	0.000	0.000	0.0000	0.0112
- Dolly Varden	0.000	0.000	0.000	0.000	0.099	0.046	0.000	0.000	0.000	0.000	0.0000	0.0149
- Whitefish	0.007	0.000	0.047	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.0033	0.0050
Km 80												
- Dolly Varden	0.000	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0037
Roving Survey												
- Rainbow	0.343	0.040	0.000	0.047	0.000	0.052	0.059	0.000	0.000	0.000	0.0115	0.0472
- Dolly Varden	0.343	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0129
- Whitefish	0.000	0.040	0.000	0.000	0.000	0.052	0.000	0.000	0.000	0.000	0.0000	0.0172

a. Weighted (see Methods).

Appendix 5. Summary of interview responses by day in the 1988 Bridge River sport fishery.

	24-May
Number of Interviews	45
Weather a	C
Mean Angler Day Length (hr.)	
- All anglers	3.3
- Complete trip interviews	
Number	45
Hours	3.3
- Incomplete trip interviews	
Number	0
Hours	-
Mean number of anglers in party	1.7
Target Species	
- Chinook	45
Harvested Catch	
- Chinook adult	11
Released Catch	
- Steelhead trout	2
- Rainbow trout	3
- Dolly Varden	1
- Sucker	4
Inspection of Catch	
- Number	6
- Number correct	5
Gear	
- Bait	37
- Lure	4
- Bait/lure	2
- Fly	0

a. C - clear; O - overcast; R - rain.

Appendix 6. Mean nose-fork length and weight, by age, sex and date, of chinook salmon harvested in the 1988 Bridge River sport fishery. a

		Male				Female				Total b			
Date	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
22-Jul	6/2	0	0.0	-	-	1	25.0	93.0	9.1	1	12.5	93.0	9.1
	5/2	0	0.0	-	-	3	75.0	89.7	9.6	4	50.0	90.0	9.6
	4/2	1	100.0	64.0	3.2	0	0.0	-	-	3	37.5	62.7	3.5
	Unknown	0	-	-	-	1	-	85.0	9.1	3	-	66.7	4.9
	Total	1	-	64.0	3.2	5	-	89.4	9.4	11	-	76.5	6.6

a. Flesh color was not recorded.
b. Sex was not recorded for 5 samples.

Appendix 7. Summary of interview responses by day from the roving survey of the 1988 upper Quesnel River sport fishery.

	06-Aug	09-Aug	13-Aug	16-Aug	20-Aug	23-Aug	27-Aug	30-Aug	03-Sep	06-Sep	10-Sep	Total
Number of Interviews	14	4	18	14	15	17	8	4	14	6	7	121
Weather a	O	O	C	R	O	C	C	O	C	R	C	-
Mean Angler Day Length (hr.)												
- All anglers	6.6	6.5	5.9	3.8	4.4	5.6	5.5	1.3	3.8	4.2	3.2	4.9
- Complete trip interviews												
Number	1	0	1	9	3	1	0	1	13	0	0	29
Hours	6.0	-	0.5	3.3	2.0	7.0	-	0.5	3.2	-	-	3.2
- Incomplete trip interviews												
Number	13	4	17	5	17	16	8	3	1	6	7	97
Hours	6.7	6.5	6.2	4.6	5.0	5.6	5.5	1.5	12.0	4.2	3.2	5.4
Mean number of anglers in party	1.8	2.0	2.1	2.6	1.8	2.6	1.0	1.8	3.0	2.3	1.6	2.2
Target Species												
- Chinook	9	2	10	1	3	9	6	0	6	0	3	49
- Rainbow trout	3	2	1	8	7	8	2	4	3	3	4	45
- Anything	2	0	7	5	5	0	0	0	5	3	0	27
Harvested Catch												
- Chinook adult	0	0	0	0	0	0	3	0	0	0	1	4
- Rainbow trout	0	0	1	2	18	2	2	2	5	0	0	32
- Dolly Varden	0	0	0	0	0	1	1	0	0	0	0	2
- Whitefish	0	0	0	0	0	0	0	0	2	0	0	2
Released Catch												
- Chinook jack	0	0	0	0	0	0	0	0	0	0	1	1
- Rainbow trout	0	2	7	14	47	0	0	1	12	4	0	87
- Dolly Varden	0	0	1	0	0	0	0	0	0	0	0	1
- Whitefish	0	1	0	0	0	0	0	0	3	0	0	4
Inspection of Catch												
- Number	0	0	1	2	18	3	6	2	7	0	1	40
- Number correct	-	-	1	2	18	3	6	2	7	-	1	40
Gear												
- Bait	4	4	4	7	8	3	7	4	7	4	2	54
- Lure	3	0	8	7	2	7	1	0	6	2	5	41
- Bait/lure	4	0	2	0	2	7	0	0	0	0	0	15
- Fly	3	0	4	0	3	0	0	0	1	0	0	11
1988 Previous Angling on Quesnel R.												
- No. who fished CN previously	0	0	2	1	3	7	3	0	3	0	3	22
- Mean previous trips per angler	-	-	2.0	1.0	3.0	1.1	3.0	-	3.0	-	4.7	
- Mean angler day length (hr) b	-	-	8.0	3.0	8.0	4.0	4.7	-	5.3	-	2.3	
- Harvest: b												
Chinook adult	0	0	0	0	2	0	2	0	0	0	0	4
Chinook jack	0	0	0	0	0	0	1	0	0	0	0	1
Rainbow	0	0	0	5	0	0	0	0	2	0	0	7
Dolly Varden	0	0	0	0	0	1	0	0	0	0	0	1

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 8. Daily angler counts in the 1988 lower Quesnel River sport fishery.

Date	Time	Region a						Total
		1	2	3	4	5	6	
06-Aug	1601-1700	2	0	0	2	2	4	10
09-Aug	1301-1400	3	0	0	2	0	2	7
13-Aug	1301-1400	3	0	0	4	2	0	9
16-Aug	1501-1600	0	0	0	0	5	0	5
20-Aug	1701-1800	4	0	0	7	0	4	15
23-Aug	1301-1400	7	0	0	5	0	3	15
27-Aug	1301-1400	5	0	0	1	0	0	6
30-Aug	1601-1700	5	0	0	4	0	0	9
03-Sep	1501-1600	5	0	0	0	4	2	11
06-Sep	1301-1400	5	0	0	1	0	0	6
10-Sep	1301-1400	0	0	0	0	0	1	1

a. Regions were:

1 - Quesnel Lake outlet to end of south side access road.
2 - End of road to Likely Bridge, north side.
3 - End of road to Likely Bridge, south side.
4 - Likely Bridge to Drop Creek, north side.
5 - Likely Bridge to Drop Creek, south side.
6 - Drop Creek to 500 m above Cariboo River confluence.

Appendix 9. Daily catch per angler hour (harvest and release) in the 1988 upper Quesnel River sport fishery.

	06-Aug	09-Aug	13-Aug	16-Aug	20-Aug	23-Aug	27-Aug	30-Aug	03-Sep	06-Sep	10-Sep	Total a	
												Weekday	Weekend
Harvest per Unit Effort (HPUE)													
- Chinook adult	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000	0.000	0.000	0.133	0.0000	0.0202
- Rainbow	0.000	0.000	0.044	0.042	0.391	0.038	0.133	0.571	0.105	0.000	0.000	0.0513	0.1310
- Dolly Varden	0.000	0.000	0.000	0.000	0.000	0.019	0.067	0.000	0.000	0.000	0.000	0.0085	0.0050
- Whitefish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	0.000	0.000	0.0000	0.0101
Release per Unit Effort (RPUE)													
- Chinook adult	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.133	0.0000	0.0050
- Rainbow	0.000	0.500	0.311	0.292	1.022	0.000	0.000	0.286	0.253	0.471	0.000	0.1795	0.3325
- Dolly Varden	0.000	0.000	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0050
- Whitefish	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.063	0.000	0.000	0.0085	0.0151

a. Weighted (see Methods).

Appendix 10a. Summary of interview responses by day at Chuck's Pool in the 1988 lower Shuswap River sport fishery.

	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	01-Sep	02-Sep	03-Sep	04-Sep	05-Sep	Total
Number of Interviews	23	33	33	23	20	20	14	17	16	29	228
Weather a	O	C	C	C	O	C	C	O	C	O	-
Mean Angler Day Length (hr.)											
- All anglers	6.7	4.8	5.2	6.7	7.0	4.6	6.2	4.7	5.8	6.0	5.7
- Complete trip interviews											
Number	2	16	9	3	3	10	5	9	10	12	79
Hours	7.0	3.5	2.6	5.7	3.5	3.6	3.9	3.2	6.1	3.7	3.9
- Incomplete trip interviews											
Number	21	17	24	20	17	10	9	8	6	17	149
Hours	6.7	4.8	6.2	6.9	7.0	5.6	7.5	6.4	5.4	7.6	6.7
Mean number of anglers in party	1.1	2.0	2.7	1.6	1.7	1.8	1.4	2.3	2.5	2.4	2.2
Target Species											
- Chinook	23	33	33	23	20	20	14	17	16	29	228
Harvested Catch											
- Chinook adults	1	5	0	0	0	0	1	0	0	0	7
- Chinook adult, adipose clipped	0	0	2	0	0	0	1	0	0	1	4
- Chinook jacks	0	0	0	1	1	0	0	0	0	0	2
Released Catch											
- Chinook adults	0	0	0	0	0	0	0	0	0	0	0
Inspection of Catch											
- Number	1	5	2	1	1	0	2	0	0	1	13
- Number correct	1	5	2	1	1	-	2	-	-	1	13
Gear											
- Bait	2	1	23	4	1	0	1	7	3	16	58
- Lure	9	16	0	7	6	12	10	3	6	0	69
- Bait/lure	10	8	10	8	11	5	3	6	7	13	81
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Shuswap R.											
- No. who fished CN previously	18	25	19	16	13	10	11	10	11	25	158
- Mean previous trips per angler	1.0	1.5	1.8	2.1	2.1	3.9	3.5	4.1	4.0	3.8	2.6
- Mean angler day length (hr) b	4.5	5.3	4.4	5.5	5.1	4.5	4.9	3.4	5.2	5.2	4.9
- Harvest: b											
Chinook adult	3	2	0	1	0	2	1	0	0	0	9
Chinook jack	0	0	1	0	0	0	0	0	0	0	1

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 10b. Summary of interview responses by day at Log Dump Pool in the 1988 lower Shuswap River sport fishery.

	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	01-Sep	02-Sep	03-Sep	04-Sep	05-Sep	Total
Number of Interviews	31	20	19	17	18	14	19	11	12	20	181
Weather a	O	C	C	C	O	C	C	O	C	O	-
Mean Angler Day Length (hr.)											
- All anglers	5.9	4.1	4.6	5.6	4.6	5.4	3.6	5.8	5.4	4.2	4.9
- Complete trip interviews											
Number	19	15	10	12	12	2	10	6	7	12	105
Hours	3.4	2.7	3.0	6.7	4.3	4.5	2.7	8.9	3.1	3.3	4.0
- Incomplete trip interviews											
Number	12	5	9	5	6	12	9	5	5	8	76
Hours	9.9	8.3	6.4	3.0	5.3	5.5	4.6	2.0	8.6	5.5	6.2
Mean number of anglers in party	2.5	2.9	2.2	2.4	1.8	1.9	1.8	1.7	2.0	1.4	
Target Species											
- Chinook	31	20	19	17	18	14	19	11	12	20	181
Harvested Catch											
- Chinook adults	0	1	0	0	1	0	1	0	0	1	4
- Chinook jacks	0	0	0	1	0	0	0	0	0	3	4
- Squawfish	0	0	0	0	1	0	0	0	0	0	1
Released Catch											
- Chinook jack	0	0	0	0	1	0	0	0	0	1	2
- Squawfish	0	0	0	0	0	0	0	0	1	0	1
Inspection of Catch											
- Number	0	1	0	1	2	0	1	0	0	4	9
- Number correct	-	1	-	1	2	-	1	-	-	4	9
Gear											
- Bait	4	3	7	6	2	2	1	5	0	6	36
- Lure	13	8	3	6	10	8	14	5	12	13	92
- Bait/lure	14	9	9	5	6	4	4	0	0	1	52
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Shuswap R.											
- No. who fished CN previously	13	17	16	8	13	11	11	8	6	16	119
- Mean previous trips per angler	1.0	1.8	1.5	2.6	2.4	4.0	3.5	5.6	3.2	5.7	3.0
- Mean angler day length (hr) b	6.7	6.3	4.6	4.6	4.6	4.6	4.9	6.3	6.8	6.7	5.7
- Harvest: b											
Chinook adult	0	2	0	0	0	1	1	0	0	1	5
Chinook jack	0	0	0	0	1	0	0	1	0	1	3

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 10c. Summary of interview responses by day from the roving survey of the 1988 lower Shuswap River sport fishery.

	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	01-Sep	02-Sep	03-Sep	04-Sep	05-Sep	Total
Number of Interviews	34	35	23	32	20	21	26	12	22	26	251
Weather a	O	C	C	C	O	C	C	O	C	O	-
Mean Angler Day Length (hr.)											
- All anglers	6.7	5.6	7.3	4.8	5.8	5.4	4.7	7.8	6.5	6.2	5.9
- Complete trip interviews											
Number	5	2	0	3	2	1	11	4	3	0	31
Hours	4.8	7.0	-	3.0	6.0	7.0	3.7	1.9	2.5	-	3.9
- Incomplete trip interviews											
Number	29	33	23	29	18	20	15	8	19	26	220
Hours	7.1	5.5	7.3	4.9	5.8	5.3	5.3	10.7	7.1	6.2	6.2
Mean number of anglers in party	2.5	2.4	2.0	1.9	1.9	1.3	1.9	1.3	1.9	1.6	
Target Species											
- Chinook	34	35	23	30	20	20	26	11	22	26	247
- Rainbow trout	0	0	0	2	0	1	0	0	0	0	3
- Squawfish	0	0	0	0	0	0	0	1	0	0	1
Harvested Catch											
- Chinook adults	5	5	0	0	0	0	0	0	0	0	10
- Chinook jacks	0	0	1	0	0	0	2	0	0	0	3
- Squawfish	0	0	0	1	0	0	1	1	0	0	3
Released Catch											
- Chinook jack	0	1	1	0	0	0	0	0	0	0	2
- Squawfish	1	3	1	2	0	1	0	0	0	2	10
Inspection of Catch											
- Number	5	5	1	1	0	0	3	1	0	0	16
- Number correct	5	5	1	1	-	-	3	1	-	-	16
Gear											
- Bait	2	7	9	1	2	1	7	5	1	2	37
- Lure	12	18	7	22	14	17	13	1	14	19	137
- Bait/lure	20	10	7	9	4	3	6	4	7	5	75
- Fly	0	0	0	0	0	0	0	0	0	0	0
1988 Previous Angling on Shuswap R.											
- No. who fished CN previously	23	16	10	16	15	19	19	10	16	19	163
- Mean previous trips per angler	1.0	1.6	2.0	2.6	2.3	4.1	3.5	2.6	4.3	4.7	2.9
- Mean angler day length (hr) b	5	8.5	9.0	6.2	5.9	5.7	4.6	6.3	7.1	6.6	6.3
- Harvest: b											
Chinook adult	0	4	2	0	1	1	0	0	1	1	10
Chinook jack	0	0	0	0	1	0	0	0	0	0	1

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 11a. Daily angler counts by subarea in the 1988 lower Shuswap River sport fishery, Mara Lake to Ashton Creek Bridge.

		Mara Lake to Ashton Creek Bridge a				
Date	Time	1	2	3	4	Total
25-Aug	1905-1957	0	5	17	19	41
26-Aug	0555-0750	0	1	7	6	14
27-Aug	0624-0708	1	6	6	16	29
28-Aug	1801-2000	0	8	19	19	46
29-Aug	0610-0806	0	4	3	2	9
01-Sep	1813-2004	0	1	18	41	60
02-Sep	0657-0734	0	5	6	7	18
03-Sep	1906-1945	0	11	19	35	65
04-Sep	0601-0818	0	5	7	7	19
05-Sep	0717-0748	0	8	6	10	24

a. Subareas were: 1 - Mara Lake to Mara Bridge
2 - Mara Bridge to Grinrod
3 - Grinrod Bridge to Enderby Bridge
4 - Enderby Bridge to Ashton Creek Bridge

Appendix 11b. Daily angler counts by subarea in the 1988 lower Shuswap River sport fishery, Ashton Creek Bridge to Mabel Lake.

		Region a					
Date	Time	1	2 b	3	4	5 b	Total
25-Aug	1800-1952	10	17	0	0	27	54
26-Aug	0604-0655	11	18	2	3	33	67
27-Aug	0618-0829	13	19	4	3	40	79
28-Aug	1819-1909	13	16	3	2	24	58
29-Aug	0622-0720	12	15	4	4	28	63
01-Sep	1852-1929	9	13	0	0	26	48
02-Sep	0551-0751	7	10	4	1	28	50
03-Sep	1817-1904	8	20	2	0	23	53
04-Sep	0612-0711	11	15	2	0	20	48
05-Sep	0632-0716	6	27	6	1	23	63

a. Subareas were: 1 - Ashton Creek Bridge to Fall Creek
2 - Fall Creek to Cooke Creek
3 - Cooke Creek to Delorme Creek
4 - Delorme Cr. to Skookumchuck
5 - Skookumchuck to Mabel Lake

b. Includes Chuck's Pool

Appendix 12. Daily catch per angler hour (harvest and release) in the 1988 lower Shuswap River sport fishery, estimated from both complete and incomplete trip interviews.

	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	01-Sep	02-Sep	03-Sep	04-Sep	05-Sep	Total a	
											Weekday	Weekend
Harvest per Unit Effort (HPUE)												
Chuck's Pool												
- Chinook adult	0.009	0.044	0.019	0.000	0.000	0.000	0.036	0.000	0.000	0.009	0.0161	0.0054
- Chinook jack	0.000	0.000	0.000	0.009	0.012	0.000	0.000	0.000	0.000	0.000	0.0019	0.0027
Log Dump Pool												
- Chinook adult	0.000	0.017	0.000	0.000	0.016	0.000	0.024	0.000	0.000	0.017	0.0068	0.0026
- Chinook jack	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.050	0.0000	0.0119
- Squawfish	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.0023	0.0000
Roving Survey												
- Chinook adult	0.040	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0242	0.0000
- Chinook jack	0.000	0.000	0.020	0.000	0.000	0.000	0.024	0.000	0.000	0.000	0.0039	0.0028
- Squawfish	0.000	0.000	0.000	0.014	0.000	0.000	0.012	0.021	0.000	0.000	0.0019	0.0140
Release per Unit Effort (RPUE)												
Log Dump Pool												
- Chinook jack	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.017	0.0023	0.0026
- Squawfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.000	0.0000	0.0026
Roving Survey												
- Chinook jack	0.000	0.011	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0019	0.0028
- Squawfish	0.008	0.032	0.020	0.028	0.000	0.017	0.000	0.000	0.000	0.030	0.0116	0.0112
- Whitefish	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000

a. Weighted (see Methods).

Appendix 13. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested in the 1988 lower Shuswap River sport fishery.

			Male				Female				Total			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
26-Aug	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	3	100.0%	89.0	8.8	2	100.0%	81.5	5.8	5	100.0%	86.0	7.6
		Unknown	1	-	88.0	5.7	0	-	-	-	1	-	88.0	5.7
		Total	4	-	88.8	8.0	2	-	81.5	5.8	6	-	86.3	7.3
27-Aug	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	1	100.0%	90.0	7.7	1	100.0%	86.0	7.4	2	100.0%	88.0	7.6
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	1	-	90.0	7.7	1	-	86.0	7.4	2	-	88.0	7.6
28-Aug	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		Unknown	1	-	35.5	0.7	0	-	-	-	1	-	35.5	0.7
		Total	1	-	35.5	0.7	0	-	-	-	1	-	35.5	0.7
29-Aug	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	0	0.0%	-	-	1	100.0%	69.0	6.8	1	100.0%	69.0	6.8
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	0	-	-	-	1	-	69.0	6.8	1	-	69.0	6.8
30-Aug	Red	5/1	0	0.0%	-	-	1	50.0%	97.0	12.7	1	50.0%	97.0	12.7
		4/1	0	0.0%	-	-	1	50.0%	85.0	7.3	1	50.0%	85.0	7.3
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	0	-	-	-	2	-	91.0	10.0	2	-	91.0	10.0
31-Aug	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	0	0.0%	-	-	2	100.0%	75.5	5.6	2	100.0%	75.5	5.6
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	0	-	-	-	2	-	75.5	5.6	2	-	75.5	5.6
01-Sep	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	0	0.0%	-	-	1	100.0%	89.0	8.4	1	100.0%	89.0	8.4
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	0	-	-	-	1	-	89.0	8.4	1	-	89.0	8.4
02-Sep	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	1	100.0%	87.0	6.8	0	0.0%	-	-	1	100.0%	87.0	6.8
		Unknown	0	-	-	-	2	-	85.5	8.6	2	-	85.5	8.6
		Total	1	-	87.0	6.8	2	-	85.5	8.6	3	-	86.0	8.0
05-Sep	Red	5/1	0	0.0%	-	-	0	0.0%	-	-	0	0.0%	-	-
		4/1	2	100.0%	89.3	9.1	0	0.0%	-	-	2	100.0%	89.3	9.1
		Unknown	3	-	40.7	0.8	0	-	-	-	3	-	40.7	0.8
		Total	5	-	60.1	4.1	0	-	-	-	5	-	60.1	4.1
Total	Red	5/1	0	0.0%	-	-	1	11.1%	97.0	12.7	1	6.3%	97.0	12.7
		4/1	7	100.0%	88.9	8.4	8	88.9%	80.4	6.6	15	93.8%	84.4	7.4
		Unknown	5	-	49.1	1.8	2	-	85.5	8.6	7	-	59.5	3.7
		Total	12	-	72.3	5.7	11	-	82.8	7.5	23	-	77.3	6.5

Appendix 14a. Summary of interview responses by day on the east bank in the 1988 Thompson River (Spences Bridge) sport fishery.

	22-Jul	29-Jul	05-Aug	12-Aug	19-Aug	26-Aug	Total
Number of Interviews	36	49	60	40	35	17	237
Weather a	O	C	O	C	O	C	-
Mean Angler Day Length (hr.)							
- All anglers	2.9	3.7	4.8	6.1	3.4	4.8	4.3
- Complete trip interviews							
Number	36	49	60	40	35	17	237
Hours	2.9	3.7	4.8	6.1	3.4	4.8	4.3
- Incomplete trip interviews							
Number	0	0	0	0	0	0	0
Hours	-	-	-	-	-	-	-
Mean number of anglers in party	2.3	2.2	2.5	2.4	2.1	1.9	2.2
Target Species							
- Chinook	36	49	60	40	35	17	237
Harvested Catch							
- Chinook adults	24	23	13	11	9	4	84
- Chinook adult, adipose clipped	4	4	5	0	0	0	13
- Chinook jack	0	0	0	1	0	0	1
- Chinook jack, adipose clipped	0	0	0	1	0	0	1
Released Catch							
- Chinook adults	8	26	9	3	1	6	53
Inspection of Catch							
- Number	28	24	18	13	9	4	96
- Number correct	28	24	18	13	9	4	96
Gear							
- Bait	28	39	37	34	31	12	181
- Lure	5	7	12	4	1	1	30
- Bait/lure	3	3	10	2	1	2	21
- Fly	0	0	0	0	0	0	0
1988 Previous Angling on Shuswap R.							
- No. who fished CN previously	0	20	35	22	24	10	111
- Mean previous trips per angler	-	1.0	1.4	2.0	3.2	4.2	2.1
- Mean angler day length (hr) b	-	3.3	4.6	5.5	5.9	6.8	5.0
- Harvest: b							
Chinook adult	0	16	20	5	4	3	48

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 14b. Summary of interview responses by day on the west bank in the 1988 Thompson River (Spences Bridge) sport fishery.

	22-Jul	29-Jul	05-Aug	12-Aug	19-Aug	26-Aug	Total
Number of Interviews	8	19	25	21	3	2	78
Weather a	O	C	O	C	O	C	-
Mean Angler Day Length (hr.)							
- All anglers	1.8	3.8	3.9		4.0	3.5	4.5
- Complete trip interviews							
Number	8	16	22	12	2	2	62
Hours	1.8	3.0	4.1	4.9	2.0	3.5	3.6
- Incomplete trip interviews							
Number	0	3	3	9	1	0	16
Hours	-	8.2	5.8	8.4	8.0	-	7.9
Mean number of anglers in party	1.0	1.7	1.7	1.7	1.7	1.0	2.2
Target Species							
- Chinook	8	19	25	21	3	2	78
Harvested Catch							
- Chinook adults	3	2	4	0	2	0	11
- Chinook adult, adipose clipped	0	1	0	0	0	0	1
Released Catch							
- Chinook adults	0	0	0	0	0	0	0
Inspection of Catch							
- Number	3	3	4	0	2	0	12
- Number correct	3	3	4	-	2	-	12
Gear							
- Bait	2	9	7	6	2	2	28
- Lure	6	7	14	5	1	0	33
- Bait/lure	0	3	3	5	0	0	11
- Fly	0	0	0	0	0	0	0
1988 Previous Angling on Shuswap R.							
- No. who fished CN previously	0	9	7	8	3	2	29
- Mean previous trips per angler	-	1.0	1.4	1.6	1.3	4.0	1.5
- Mean angler day length (hr) b	-	2.8	3.2	3.4	2.7	3.3	3.1
- Harvest: b							
Chinook adult	0	2	2	2	0	0	6

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Appendix 15. Daily catch per angler hour (harvest and release) in the 1988 Thompson River (Spence Bridge) sport fishery.

	22-Jul	29-Jul	05-Aug	12-Aug	19-Aug	26-Aug	Total
Harvest per Unit Effort (HPUE)							
East Side							
- Chinook adult	0.268	0.151	0.063	0.045	0.075	0.050	0.0958
- Chinook jack	0.000	0.000	0.000	0.008	0.000	0.000	0.0020
West Side							
- Chinook adult	0.203	0.049	0.041	0.000	0.333	0.000	0.0434
Release per Unit Effort (RPUE)							
East Side							
- Chinook adult	0.077	0.145	0.031	0.012	0.008	0.074	0.0523
West Side							
- Chinook adult	0.000	0.000	0.000	0.000	0.000	0.000	0.0000

a. Weighted (see Methods).

Appendix 16a. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested on the east side in the 1988 Thompson River (Spences Bridge) sport fishery.

			Male				Female				Total			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
22-Jul	Red	5/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/2	0	0.0	-	-	16	88.9	70.3	3.9	16	88.9	70.3	3.9
		4/1	0	0.0	-	-	2	11.1	68.0	3.9	2	11.1	68.0	3.9
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	10	-	69.4	3.8	10	-	69.4	3.8
		Total	0	-	-	-	28	-	69.8	3.8	28	-	69.8	3.8
29-Jul	Red	5/2	0	0.0	-	-	2	8.3	84.0	7.2	2	15.4	84.0	7.2
		4/2	1	7.7	64.0	2.7	7	29.2	70.3	3.8	8	61.5	69.5	3.7
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	1	7.7	64.0	3.2	2	8.3	64.5	3.5	3	23.1	64.3	3.4
		Unknown	5	-	71.4	4.7	9	-	68.6	3.5	14	-	69.6	3.9
		Total	7	-	69.3	4.2	20	-	70.3	4.0	27	-	70.0	4.0
05-Aug	Red	5/2	0	0.0	-	-	1	4.8	83.0	5.5	1	7.7	83.0	5.5
		4/2	4	30.8	72.8	4.2	3	14.3	76.8	5.1	7	53.8	74.5	4.6
		4/1	0	0.0	-	-	1	4.8	80.0	5.5	1	7.7	80.0	5.5
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	1	7.7	69.0	4.3	3	14.3	65.67	3.2	4	30.8	66.5	3.5
		Unknown	3	-	69.3	4.1	7	-	69.2	3.9	10	-	69.3	4.0
		Total	8	-	71.0	4.2	15	-	71.7	4.2	23	-	71.4	4.2
12-Aug	Red	5/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/2	3	60.0	74.3	4.4	2	40.0	65.5	3.2	5	100.0	70.8	3.9
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	3	-	71.3	3.8	5	-	64.6	3.2	8	-	67.1	3.4
		Total	6	-	72.8	4.1	7	-	64.9	3.2	13	-	68.5	3.6
	White	5/2	0	0.0	-	-	1	50.0	82.0	6.4	1	50.0	82.0	6.4
		4/2	1	50.0	96.0	7.3	0	0.0	-	-	1	50.0	96.0	7.3
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	1	-	96.0	7.3	1	-	82.0	6.4	2	-	89.0	6.8
26-Aug	Red	5/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	2	-	68.0	3.4	1	-	70.0	3.6	3	-	68.7	3.5
		Total	2	-	68.0	3.4	1	-	70.0	3.6	3	-	68.7	3.5

Appendix 16a. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested on the east side in the 1988 Thompson River (Spences Bridge) sport fishery.

			Male				Female				Total			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
Total	Red	5/2	0	0.0	-	-	3	3.4	83.7	6.6	3	6.1	83.7	6.6
		4/2	8	16.3	72.3	4.1	28	31.8	70.7	3.9	36	73.5	70.6	3.9
		4/1	0	0.0	-	-	3	3.4	72.0	4.4	3	6.1	72.0	4.4
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	2	4.1	66.5	3.7	5	5.7	65.2	3.3	7	14.3	65.5	3.8
		Unknown	13	-	70.4	4.2	32	-	68.4	3.6	45	-	69.0	3.8
		Total	23	-	70.7	4.1	71	-	69.9	3.9	94	-	70.1	3.9
	White	5/2	0	0.0	-	-	1	50.0	82.0	6.4	1	50.0	82.0	6.4
		4/2	1	50.0	96.0	7.3	0	0.0	-	-	1	50.0	96.0	7.3
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	0	-	-	-	0	-	-	-
		Total	1	-	96.0	7.3	1	-	82.0	6.4	2	-	89.0	6.8
	Total	5/2	0	0.0	-	-	4	4.4	83.5	6.5	4	7.8	83.3	6.5
		4/2	9	17.6	74.9	4.4	28	30.8	70.7	3.9	37	72.5	71.7	4.1
		4/1	0	0.0	-	-	3	3.3	72.0	4.4	3	5.9	72.0	4.4
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	2	3.9	66.5	3.7	5	5.5	65.2	3.3	7	13.7	65.6	3.4
		Unknown	13	-	70.4	4.2	32	-	68.4	3.6	45	-	69.0	3.8
		Total	24	-	71.8	4.2	72	-	70.0	3.9	96	-	70.5	4.0

Appendix 16b. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested on the west side in the 1988 Thompson River (Spences Bridge) sport fishery.

			Male				Female				Total			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
22-Jul	Red	5/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/2	2	100.0	67.8	3.2	0	0.0	-	-	2	100.0	67.8	3.2
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	1	-	71.0	3.9	1	-	71.0	3.9
		Total	2	-	67.8	3.2	1	-	71.0	3.9	3	-	68.8	3.4
29-Jul	Red	5/2	0	0.0	-	-	1	50.0	85.0	5.9	1	50.0	85.0	5.9
		4/2	0	0.0	-	-	1	50.0	62.0	2.3	1	50.0	62.0	2.3
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	1	-	62.0	2.3	1	-	62.0	2.3
		Total	0	-	-	-	3	-	74.0	4.5	3	-	74.0	4.5
05-Aug	Red	5/2	0	0.0	-	-	1	33.3	89.0	6.8	1	33.3	89.0	6.8
		4/2	1	33.3	72.0	3.6	1	33.3	76.0	4.5	2	66.7	74.0	4.1
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	1	-	94.0	7.3	0	-	-	-	1	-	94.0	7.3
		Total	2	-	83.0	5.5	2	-	82.8	5.6	4	-	82.8	5.6
19-Aug	Red	5/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		4/2	0	0.0	-	-	1	100.0	68.0	3.2	1	100.0	68.0	3.2
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	0	-	-	-	1	-	69.0	3.2	1	-	69.0	3.2
		Total	0	-	-	-	2	-	68.5	3.2	2	-	68.5	3.2
Total	Red	5/2	0	0.0	-	-	2	25.0	87.0	6.4	2	25.0	87.0	6.4
		4/2	3	37.5	69.2	3.3	3	37.5	68.7	3.3	6	75.0	68.9	3.3
		4/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/2	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		3/1	0	0.0	-	-	0	0.0	-	-	0	0.0	-	-
		Unknown	1	-	94.0	7.3	3	-	71.7	4.2	4	-	77.3	4.9
		Total	4	-	75.4	4.3	8	-	74.4	4.4	12	-	74.7	4.4

Appendix 17. Summary of angler estimates of chinook adult harvest and hours fished on the most recent 1988 fishing trip, by area and trip frequency.

	Bowron River interviews					Quesnel River interviews				
Previous trips	Number b	%	Hours fished	Chinook adult harvest	HPUE	Number b	%	Hours fished	Chinook adult harvest	HPUE
0 a	198	53.4%	0.0	0	-	85	79.4%	-	-	-
1	86	23.2%	490.0	11	0.0224	8	7.5%	32.0	0	0.0000
2	45	12.1%	284.5	8	0.0281	6	5.6%	30.0	0	0.0000
3	16	4.3%	125.0	4	0.0320	4	3.7%	28.0	4	0.1429
4	8	2.2%	111.0	0	0.0000	1	0.9%	8.0	0	0.0000
5	6	1.6%	57.0	2	0.0351	1	0.9%	2.0	0	0.0000
6	6	1.6%	50.5	2	0.0396	1	0.9%	6.0	0	0.0000
7	3	0.8%	31.0	0	0.0000	1	0.9%	2.0	0	0.0000
8	2	0.5%	16.0	0	0.0000	0	0.0%	-	-	-
9	1	0.3%	3.0	0	0.0000	0	0.0%	-	-	-
10	0	0.0%	-	-	-	0	0.0%	-	-	-
11	0	0.0%	-	-	-	0	0.0%	-	-	-
12	0	0.0%	-	-	-	0	0.0%	-	-	-

a. Excludes opening day interviews.
b. Excludes anglers unable to recall most recent trip duration.

Appendix 17 continued. Summary of angler estimates of chinook adult harvest and hours fished on most recent 1988 fishing trip, by area and trip frequency.

	Shuswap River interviews					Thompson River interviews				
Previous trips	Number b	%	Hours fished	Chinook adult harvest	HPUE	Number b	%	Hours fished	Chinook adult harvest	HPUE
0 a	187	29.9%	0.0	0	-	131	48.3%	0.0	0	-
1	159	25.4%	799.5	8	0.0100	71	26.2%	255.2	31	0.1215
2	104	16.6%	618.0	6	0.0097	31	11.4%	166.0	14	0.0843
3	64	10.2%	331.5	2	0.0060	16	5.9%	80.5	4	0.0497
4	28	4.5%	165.5	2	0.0121	15	5.5%	95.5	3	0.0314
5	30	4.8%	218.5	2	0.0092	6	2.2%	43.3	1	0.0231
6	19	3.0%	78.5	2	0.0255	1	0.4%	8.0	1	0.1250
7	15	2.4%	93.5	2	0.0214	0	0.0%	0.0	0	-
8	3	0.5%	30.0	0	0.0000	0	0.0%	0.0	0	-
9	5	0.8%	33.5	0	0.0000	0	0.0%	0.0	0	-
10	6	1.0%	54.0	0	0.0000	0	0.0%	0.0	0	-
11	4	0.6%	36.0	0	0.0000	0	0.0%	0.0	0	-
12	2	0.3%	8.0	0	0.0000	0	0.0%	0.0	0	-

a. Excludes opening day interviews.
b. Excludes anglers unable to recall most recent trip duration.

Appendix 18a. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Bowron River sport fishery, estimated from complete trip interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	20	8.5%	18.0	1.6%	0	0.0%	0.0000
1.1 - 2.0	37	15.7%	61.0	5.6%	2	7.4%	0.0328
2.1 - 3.0	21	8.9%	58.0	5.3%	1	3.7%	0.0172
3.1 - 4.0	41	17.4%	155.5	14.2%	9	33.3%	0.0579
4.1 - 5.0	40	17.0%	191.5	17.5%	2	7.4%	0.0104
5.1 - 6.0	15	6.4%	88.5	8.1%	0	0.0%	0.0000
6.1 - 7.0	25	10.6%	173.0	15.8%	5	18.5%	0.0289
7.1 - 8.0	8	3.4%	64.0	5.9%	1	3.7%	0.0156
8.1 - 9.0	7	3.0%	62.0	5.7%	0	0.0%	0.0000
9.1 - 10.0	13	5.5%	126.5	11.6%	3	11.1%	0.0237
10.1 - 11.0	2	0.9%	21.0	1.9%	4	14.8%	0.1905
11.1 - 12.0	4	1.7%	47.0	4.3%	0	0.0%	0.0000
12.1 - 13.0	2	0.9%	25.5	2.3%	0	0.0%	0.0000
13.1 - 14.0	0	0.0%	0.0	0.0%	0	0.0%	0.0000

Appendix 18b. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Bowron River sport fishery, estimated from all interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	79	17.8%	58.8	3.2%	0	0.0%	0.0000
1.1 - 2.0	67	15.1%	117.5	6.4%	4	10.3%	0.0340
2.1 - 3.0	58	13.1%	162.0	8.8%	2	5.1%	0.0123
3.1 - 4.0	60	13.5%	228.5	12.5%	11	28.2%	0.0481
4.1 - 5.0	49	11.0%	235.0	12.8%	2	5.1%	0.0085
5.1 - 6.0	30	6.8%	176.0	9.6%	1	2.6%	0.0057
6.1 - 7.0	41	9.2%	283.0	15.4%	9	23.1%	0.0318
7.1 - 8.0	15	3.4%	117.5	6.4%	2	5.1%	0.0170
8.1 - 9.0	14	3.2%	124.0	6.8%	1	2.6%	0.0081
9.1 - 10.0	19	4.3%	185.0	10.1%	3	7.7%	0.0162
10.1 - 11.0	3	0.7%	32.0	1.7%	4	10.3%	0.1250
11.1 - 12.0	4	0.9%	47.0	2.6%	0	0.0%	0.0000
12.1 - 13.0	2	0.5%	25.5	1.4%	0	0.0%	0.0000
13.1 - 14.0	3	0.7%	41.5	2.3%	0	0.0%	0.0000
14.1 - 15.0	0	0.0%	0.0	0.0%	0	0.0%	0.0000
15.1 - 16.0	0	0.0%	0.0	0.0%	0	0.0%	0.0000
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	0.0000

Appendix 18c. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Quesnel River sport fishery, estimated from complete trip interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	9	31.0%	7.5	8.2%	0	-	0.0000
1.1 - 2.0	3	10.3%	4.5	4.9%	0	-	0.0000
2.1 - 3.0	0	0.0%	0.0	0.0%	0	-	-
3.1 - 4.0	10	34.5%	37.5	41.0%	0	-	0.0000
4.1 - 5.0	3	10.3%	15.0	16.4%	0	-	0.0000
5.1 - 6.0	1	3.4%	6.0	6.6%	0	-	0.0000
6.1 - 7.0	3	10.3%	21.0	23.0%	0	-	0.0000
7.1 - 8.0	0	0.0%	0	0.0%	0	-	-
8.1 - 9.0	0	0.0%	0	0.0%	0	-	-
9.1 - 10.0	0	0.0%	0	0.0%	0	-	-
10.1 - 11.0	0	0.0%	0	0.0%	0	-	-
11.1 - 12.0	0	0.0%	0	0.0%	0	-	-
12.1 - 13.0	0	0.0%	0	0.0%	0	-	-
13.1 - 14.0	0	0.0%	0	0.0%	0	-	-

Appendix 18d. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 upper Quesnel River sport fishery, estimated from all interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	47	38.8%	36.5	11.3%	2	50.0%	0.0548
1.1 - 2.0	25	20.7%	42.0	13.0%	2	50.0%	0.0476
2.1 - 3.0	7	5.8%	19.5	6.0%	0	0.0%	0.0000
3.1 - 4.0	16	13.2%	68.5	21.2%	0	0.0%	0.0000
4.1 - 5.0	10	8.3%	50.0	15.5%	0	0.0%	0.0000
5.1 - 6.0	7	5.8%	41.5	12.8%	0	0.0%	0.0000
6.1 - 7.0	6	5.0%	41.5	12.8%	0	0.0%	0.0000
7.1 - 8.0	3	2.5%	24.0	7.4%	0	0.0%	0.0000
8.1 - 9.0	0	0.0%	0.0	0.0%	0	0.0%	-
9.1 - 10.0	0	0.0%	0.0	0.0%	0	0.0%	-
10.1 - 11.0	0	0.0%	0.0	0.0%	0	0.0%	-
11.1 - 12.0	0	0.0%	0.0	0.0%	0	0.0%	-
12.1 - 13.0	0	0.0%	0.0	0.0%	0	0.0%	-
13.1 - 14.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 18e. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Shuswap River sport fishery, estimated from complete trip interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	11	5.2%	9.0	1.1%	0	0.0%	0.0000
1.1 - 2.0	40	18.8%	70.5	8.7%	2	12.5%	0.0284
2.1 - 3.0	51	23.9%	140.5	17.3%	2	12.5%	0.0142
3.1 - 4.0	47	22.1%	180.5	22.2%	3	18.8%	0.0166
4.1 - 5.0	21	9.9%	99.0	12.2%	4	25.0%	0.0404
5.1 - 6.0	17	8.0%	100.0	12.3%	0	0.0%	0.0000
6.1 - 7.0	12	5.6%	83.0	10.2%	3	18.8%	0.0361
7.1 - 8.0	4	1.9%	30.5	3.8%	0	0.0%	0.0000
8.1 - 9.0	7	3.3%	63.0	7.8%	2	12.5%	0.0317
9.1 - 10.0	1	0.5%	9.5	1.2%	0	0.0%	0.0000
10.1 - 11.0	0	0.0%	0.0	0.0%	0	0.0%	-
11.1 - 12.0	0	0.0%	0.0	0.0%	0	0.0%	-
12.1 - 13.0	2	0.9%	26.0	3.2%	0	0.0%	0.0000
13.1 - 14.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 18f. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Shuswap River sport fishery, estimated from all interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	116	17.7%	87.0	14.6%	0	0.0%	0.0000
1.1 - 2.0	151	23.0%	265.5	44.6%	3	33.3%	0.0113
2.1 - 3.0	115	17.5%	283.0	47.5%	3	33.3%	0.0106
3.1 - 4.0	95	14.5%	364.0	61.1%	10	111.1%	0.0275
4.1 - 5.0	65	9.9%	309.(	51.9%	9	100.0%	0.0291
5.1 - 6.0	45	6.8%	263.5	44.2%	1	11.1%	0.0038
6.1 - 7.0	20	3.0%	139.0	23.3%	3	33.3%	0.0216
7.1 - 8.0	18	2.7%	140.5	23.6%	2	22.2%	0.0142
8.1 - 9.0	8	1.2%	72.0	12.1%	2	22.2%	0.0278
9.1 - 10.0	13	2.0%	127.5	21.4%	0	0.0%	0.0000
10.1 - 11.0	2	0.3%	22.0	3.7%	0	0.0%	0.0000
11.1 - 12.0	3	0.5%	35.0	5.9%	1	11.1%	0.0286
12.1 - 13.0	4	0.6%	52.0	8.7%	0	0.0%	0.0000
13.1 - 14.0	1	0.2%	14.0	2.4%	0	0.0%	0.0000
14.1 - 15.0	1	0.2%	15.0	2.5%	0	0.0%	0.0000
15.1 - 16.0	0	0.0%	0.0	0.0%	0	0.0%	-
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 18g. Number of anglers interviewed, total angler effort, chinook adult harvest and HPUE by trip duration in the 1988 Thompson River (Spences Bridge) sport fishery, estimated from complete trip interviews.

Angler day length (hour)	Angler interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0.0 - 1.0	45	14.3%	30.7	2.4%	25	22.9%	0.8143
1.1 - 2.0	66	21.0%	118.0	9.2%	28	25.7%	0.2373
2.1 - 3.0	47	14.9%	130.8	10.1%	19	17.4%	0.1453
3.1 - 4.0	54	17.1%	206.0	16.0%	16	14.7%	0.0777
4.1 - 5.0	28	8.9%	133.5	10.4%	6	5.5%	0.0449
5.1 - 6.0	18	5.7%	106.5	8.3%	3	2.8%	0.0282
6.1 - 7.0	7	2.2%	46.5	3.6%	3	2.8%	0.0645
7.1 - 8.0	9	2.9%	69.8	5.4%	2	1.8%	0.0287
8.1 - 9.0	1	0.3%	8.5	0.7%	1	0.9%	0.1176
9.1 - 10.0	13	4.1%	128.5	10.0%	2	1.8%	0.0156
10.1 - 11.0	12	3.8%	131.0	10.2%	2	1.8%	0.0153
11.1 - 12.0	15	4.8%	179.0	13.9%	2	1.8%	0.0112

Appendix 19. Variance estimation procedure for access point surveys (adapted from DPA Group Inc. (MS 1985a)).

CATCH (C)

$$(1)\ \mathrm{Var}(C) = \bar{c}^2\ E^2 \left[\frac{\mathrm{Var}(E)}{E^2} + \frac{\mathrm{Var}(\bar{c})}{\bar{c}^2} + \frac{\mathrm{Var}(E)\mathrm{Var}(\bar{c})}{\bar{c}^2\ E^2} \right]$$

where: E = estimated study period effort (hours),
$\mathrm{Var}(E)$ = variance of the estimated study period effort (see equation 2),
$\bar{c}$ = estimated study period catch per angler hour,
$\mathrm{Var}(\bar{c})$ = variance of the estimated study period catch per angler hour (see equation 3).

EFFORT (E)

$$(2)\ \mathrm{Var}(E) = N^2 \left[\frac{\bar{y}_j^*}{\bar{p}_j^*} \right]^2 \left[\frac{\mathrm{Var}(\bar{y}_j^*)}{\bar{y}_j^{*2}} + \frac{\mathrm{Var}(\bar{p}_j^*)}{\bar{p}_j^{*2}} - \frac{2\ \mathrm{Cov}(\bar{y}_j^*, \bar{p}_j^*)}{(\bar{y}_j^*)(\bar{p}_j^*)} \right]$$

where: N = total days in study period,
$\bar{y}_j^*$ = mean instantaneous rod count (hour j*),
$\mathrm{Var}\ \bar{y}_j^*$ = variance at the mean rod count at hour j* (see equation 4),
$\bar{p}_j^*$ = proportion of daily angler hours occurring at time of instantaneous rod count,
$\mathrm{Var}\ \bar{p}_j^*$ = variance of the proportion of daily angler hours occurring at time of instantaneous rod count (see equation 5).

CATCH PER UNIT EFFORT ($\bar{c}$)

Because $\bar{c}$ is a ratio of catch to time of interview ($\hat{x}$) and time fished to time of interview ($\hat{t}$), a Taylor series approximation to the variance of the ratio of random variables was used. Because we expected to interview a relatively large proportion of the anglers, especially at the access point sites, the greatest variance was expected to occur at the stint level; consequently, the following estimate embodies only that sampling stage.

$$(3)\ \mathrm{Var}(\bar{c}) = \left[\frac{\hat{x}}{\hat{t}} \right]^2 \left[\frac{\mathrm{Var}(\hat{x})}{\hat{x}^2} + \frac{\mathrm{Var}(\hat{t})}{\hat{t}^2} - \frac{2\ \mathrm{Cov}(\hat{x}, \hat{t})}{(\hat{x})(\hat{t})} \right]$$

where:
$$\mathrm{Cov}(\hat{x}, \hat{t}) = \sum_i \sum_l N^2\ (1/n_{ij} - 1/N) \sum_f \left[\frac{(\hat{x}_{ilf}\hat{t}_{ilf}) - 1/n_{ij} \sum_f \hat{x}_{ilf} \sum_i \hat{t}_{ilf}}{n_{ij} - 1} \right]$$

$$\mathrm{Var}(\hat{x}) = \sum_i \sum_l N^2\ (1/n_{ij} - 1/N) \sum_f \left[\frac{(\hat{x}_{ilf} - (1/n_{ij} \sum_f \hat{x}_{ilf}))^2}{n_{ij} - 1} \right]$$

$\mathrm{Var}(\hat{t})$ is analogous to above.

$\hat{X}_{ilf}$ = estimated total catch for the f^{th} stint of the l^{th} stint type at the i^{th} site,

$\hat{T}_{ilf}$ = estimated total angler hours for the f^{th} stint of the l^{th} stint type at the i^{th} site,

n_{ij} = number of interview sample days at site i on hour j.

MEAN INSTANTANEOUS ROD COUNT ($\bar{y}_j^*$)

$$(4)\quad \mathrm{Var}(\bar{y}_j^*) = (1/n_j^* - 1/N) \sum_k \left[\frac{(y_j^*{}_k - \bar{y}_j^*)^2}{n_j^* - 1} \right]$$

where: n_j^* = number of instantaneous rod counts at hour j*,

$y_j^*{}_k$ = instantaneous rod count (all sites) on day k,

$\bar{y}_j^*$ = estimated mean rod count at hour j*.

PROPORTION OF DAILY EFFORT AT TIME OF INSTANTANEOUS ROD COUNT ($\bar{p}_j^*$).

Because $\bar{p}_j^*$ is a ratio of $\hat{R}_j^*$ and $\sum R_j$, the following Taylor Series approximation to the variance of the ratio at random variables was used:

$$(5)\quad \mathrm{Var}(\bar{p}_j^*) = \left[\frac{\hat{R}_j^*}{\sum_j \hat{R}_j} \right]^2 \left[\frac{\mathrm{Var}(\hat{R}_j^*)}{\hat{R}_j^{*2}} + \frac{\mathrm{Var} \sum_j \hat{R}_j}{\sum_j \hat{R}_j^2} - \frac{2\ \mathrm{Cov}(\hat{R}_j^*, \sum_j \hat{R}_j)}{(\hat{R}_j^*)\ (\sum_j \hat{R}_j)} \right]$$

where:

$$\mathrm{Cov}(\hat{R}_j^*, \sum_j \hat{R}_j) = \sum_i N^2 (1/n_{ij}^* - 1/N) \sum_k \left[\frac{(r_{ij}^*{}_k \sum_j r_{ijk}) - (1/n_{ij}^* \sum_k r_{ij}^*{}_k \sum_i \sum_j r_{ijk})}{n_{ij}^* - 1} \right]$$

$$\mathrm{Var}(\hat{R}_j^*) = \sum_i N^2 (1/n_{ij}^* - 1/N) \sum_k \left[\frac{(r_{ij}^*{}_k - (1/n_{ij}^* \sum_k r_j^*{}_k))^2}{n_{ij}^* - 1} \right]$$

$\mathrm{Var} \sum_j \hat{R}_j$ is analagous to above.

N = number of days in stratum,

n_{ij}^* = number of interview sample days at site i,

r_{ijk} = rod count at site i at hour j on day k,

$r_{ij}^*{}_k$ = rod count at site i on day k at the hour of the instantaneous effort count,

$\hat{R}_j^*$ = estimated total effort (rod hours) during the instantaneous rod count time block,

$\sum_j \hat{R}_j$ = estimated number of rods hours over all hours and days at the sites surveyed.